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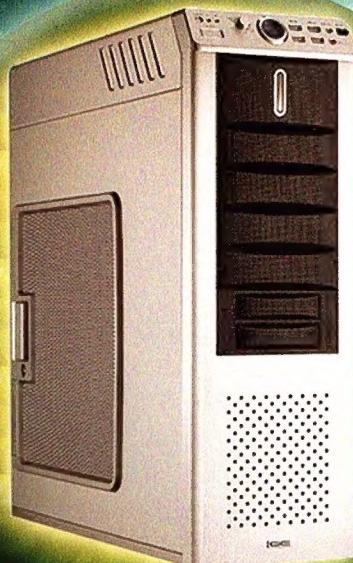
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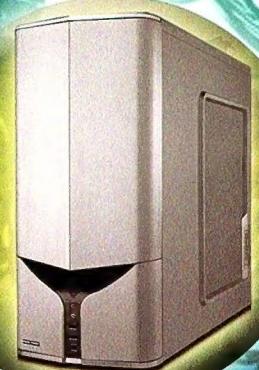## MAXIMUM POWER COMPUTING

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EDHEAD

Two things

I have – almost literally – just come back from an incredible overclocking event in Hong Kong. It was made of awesome and 1600 liters of liquid nitrogen. Let me say that again.

1600 liters.

There were 40 of the best overclockers in the world from countries as far afield as Portugal, South Africa and Finland. People from all walks of life, brought together by shared passion for overclocking. That, and a hell of a lot of beer…

It was a great chance, too, to personally meet and even wider cross section of enthusiast computing. It's one of the many great things about being in this job, that ability to meet and connect with new people who share the same passions (you can read more about the event at www.   atomicmpc.com.au).

And this month, I want you to connect with us. There are a couple of ways to do this, and it's easier than you might think.

First up, I want you to turn to page 29 (not right now, of course, finish reading this bit first) and have a look for a URL. It will direct you to our new Reader's Survey. We are very keen to find out about you, our most valued readers, and find about what you want to see in the pages of this magazine. Remember, this is yours as much as it is anyone's, and while we feel we already offer a pretty great mix of tech, news and gaming, we still want to make sure it's the right mix. You can help us in the ongoing mission to make Atomic the best damned magazine in the world – maybe even beyond…

Oh, and if you're very lucky you'll get $500 cold hard cash for your troubles! That'll buy a lot of RAM.

Once you've done with that, I want you to open whatever you use for a diary, and mark a date.

18th of October, 2008.

This (no, don't do it now, finish reading!) is a very important date, possibly one of the most important in the Atomic calendar. This is the date for this year's Atomic LIVE event, an awesome day of everything that makes Atomic – and Atomicans – great. And on top of that, it's about connecting with people: the people who make your favourite hardware, or who make this magazine (I'll be the one with the hair), or who you know on the forums. It's a day of games, tech, learning, and friends – either meeting old ones or making new ones.

We had nearly 2,000 people go through the door last year, and we want a lot more this year. Okay, done reading? Then hop to it, soldier, and I'll see you in October!

David Hollingworth
dhollingworth@atomicmpc.com.au

SCANNER

Game, industry and online news for the enthusiast

SCANNER

The fallout

James Matson is not on the drugs that killed River Phoenix, or any other kind. Promise.

By now you're no doubt fully aware that thanks to an OFLC (Office of Film and Literature Classification) ruling, Fallout 3 will not be coming to our shore; at least, not via any legal commerce channel. Fallout 3 wasn't banned, it was just refused classification, which – despite being something completely different – isn't banning. For the Aussie consumer it means pretty much the same thing: you will not be seeing the third instalment of Bethesda's edgy post apocalyptic sci-fi saga on the shelves of any local retailer. The 'RC' (Refused Classification) rating given by the OFLC was not for the violence that F3 is sure to contain, but because of in-game drug use, including the depiction of morphine injections to mask pain. The message from the OFLC is clear…

"In the Board's view the drug use, in particular the use of a proscribed drug, via means of selection from a menu, is related to incentive and rewards as the incentive to take the drug is to progress through the game more easily and as such is refused classification."

Had Australia been in line with every other developed country in the world and had an R18+ rating in place for interactive entertainment, Fallout 3 would have most likely come under that rating, but as we only rate games as high as M15+ before they're refused classification, Fallout 3 missed out. So what were the effects of F3 joining the ever growing list of quality games being refused classification in Australia?

First, and most obvious, there are the pissed off gamers, and however often we're told that we're a vocal 'minority', this time we can be heard loud and clear. People are angry, really angry – they're banging things together, jumping up and down and throwing scowls at random people on the street. The dissent is a little louder than with some OFLC decisions, because Fallout 3 is more than just a game. It's a gaming institution, a brand name – a legacy. It'd be like refusing classification to a Street Fighter title, or the next World of Warcraft expansion. Gamers love Fallout, from the 1950s 'Atomic age' style art direction to the promise of radioactive good times – and to know that we're being denied the right to choose to purchase the title is maddening to fans.

Australia is also getting pushed into front-page news on internet gaming portals, where once again we're mistaken for having a love of 'Fosters Lager' and sharing our bathrooms with poisonous Cretaceous period amphibians. One thing the international community is getting right about us, though, is that our lack of an R18+ rating for games is at the very least baffling, and at worst, embarrassing.

Baffling because we're willing to let games like Bioshock (which features the constant injection of drug-like 'plasmids' to progress in the game) through with a mature classification, but stop short of giving Fallout 3 the same rating. Embarrassing because folk like Michael Atkinson, Attorney General of South Australia and staunch advocate of no R18+ rating for games are issuing incredibly vague statements about why we're still living in the dark ages of media classification,

"I am aware that statistics show many game players are adults" he says, "If adult gamers are so keen to have R18+ games, I expect children would be just as keen."

He acknowledges that many game players are adults (and the fact is it's not many, but most – the demographics are there, gaming is an adult platform now) but at the same time goes on to say that if there's a chance children might want adult games, then adults can't have them. That's the entire crux of the argument, and to be honest, it's not doing much for the credibility of Australia as a gaming nation, which doesn't just affect the consumer, but developers and publishers too.

The good side? Well there is one. Fallout's 'RC' has once again brought the debate about an R18+ rating for games into the spotlight, and after so many discussions and knock-backs of proposed changes to the classification system in Australia, it really was going to take something like the Fallout series to get the wheels moving again. Are lots of people going to download or import the title regardless? You better believe it. It's not the right way to go about these things, but at the end of the day unless there is a modified version of Fallout 3 re-submitted for OFLC approval, those will be the only options available.

> ## The demographics are there – gaming is an adult platform now...
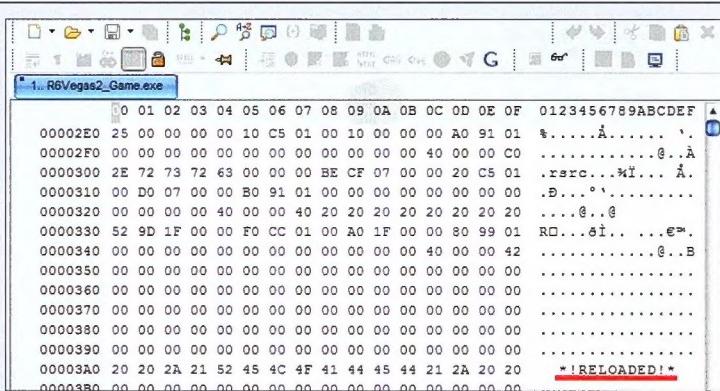
If you refer to No-CD patches or cracks on UbiSoft's forums, you'll get warned, banned or completely obliterated from the timeline, such is the company's passionate hatred for the executables which aid piracy efforts. There's no small amount of irony then, in the discovery that the official patch for UbiSoft's *Rainbow 6: Vegas 2* game when opened in a hex editor, clearly shows the code as having come from the well known piracy/warez group 'RELOADED'. Ubisoft seems to despise piracy, unless it involves the French developer stealing from others.

atomic

Less is War

Warhammer MMO looms closer, but with less content.

Age of Conan didn't quite tear apart World of Warcraft like we were hoping. Oh sure, it left a bruise here and there, maybe a scrape and some ruffled hair, but WoW has survived, so all eyes are turning to Warhammer Online: Age of Reckoning as the next contender for WoW's player base. Unfortunately some sad news has come out of developer EA Mythic recently, with confirmation that four classes originally intended for the game – Choppa, Hammerer, Blackguard and Knight of the Blazing Sun – have all been axed from the launch version of the MMO. Considering that 'Choppa' was going to be a fan favorite, the quality concerns must have been dire. The launch version will also feature only two of the intended six capital cities within the world, EA Mythic again citing quality concerns with the final product as the reason behind the cuts,

"We wanted to make our capital cities the best in any MMO," commented Mythic VP Mark Jacobs. "We think we're doing that, but it came at a price

and that price is that the other cities aren't going in the game."

For all that EA Mythic is cutting from the game, they're also including some surprises too – one of them Punkbuster anti-cheating mechanisms. While players of FPS games like Battlefield would be familiar with Punkbuster anti-cheat protection, Warhammer Online will be the first MMO to utilise the technology.

ATI x 2 = Win?

ATI cooking up a GPU storm.

The reception has been relatively positive for the Radeon HD 4850 and 4870, which allows ATI to project a bit more of a solid competitive image against NVIDIA, who'se been dominating the

GPU market of late. The boys in red aren't sitting on their hands though, with the next ATI product about to hit code-named the R700, a high end beast that follows the current trend of slapping two GPUs on the same PCB to make something fast and scary, which they call the 4870 X2.

Initial looks at engineering samples have proved the product gets a tick in both the scary and fast stakes, which makes us happy in the pants. The X2's 1600 stream processors have a peak combined computation rate of 2.4 teraflops. That's tasty. Healthy competition and incredible GPU performance from both the big vendors means more choice, and more gaming bliss for us, so bring on the X2 and its teraflops of power.

Guild Wars 2
September 2008

The original Guild Wars sort of snuck into the MMORPG world; it didn't make any huge waves, but managed to score a healthy bunch of devout fans thanks to its slick graphics, fun gameplay and well balanced team PvP. In an interesting move developers ArenaNet will cease creating expansions for Guild Wars, and instead release a shiny new Guild Wars 2. With a new graphics engine and a 'persistent' world more aligned with the classic MMO model than the original Guild Wars 'instanced' areas, it's come as a pleasant surprise that ArenaNet has assured fans that there will still be no monthly subscription costs for Guild Wars 2. So a professional quality MMO with fast paced PvP, an established player base and no monthly costs? Where do we sign up!

[Platform] PC
[Developer] ArenaNet
[Publisher] NCSoft
[Web] www.guildwars.com

Graphics card manufacturer PowerColor has pushed a behemoth new card onto the market – the PCS HD4850 – with no less than 2GB of onboard memory. That's right, the card is based on the RV770 core with 800 stream processors, but manages to squish 2GB of GDDR3 onto the PCB, leaving you with more graphics memory than perhaps you – or the game you're playing – will know what to do with. Perhaps useful for those running their titles at 9999 x 9999 resolution, but we're dubious about the immediate benefits for anyone else.

It's always sad when a game developer goes belly up, but it's even worse when the affair is one of confusion and crazy corporate attacks. Flagship Studios – developers of *Hellgate: London* – has shut its doors, and there appears to be a fair amount of contention as to who owns the IP to Flagship's suite of games, Hellgate among them. A fan site reported that the parent company HanbiSoft was taking control of *Hellgate: London*, but this has brought a flat out denial from Flagship itself.

There's been some criticism levelled at this years E3 conference, which continued a trend of downsizing the scope of the event and limiting attendees. The show was artificially small in comparison with older events, and some have claimed this is stifling the spirit of the event. IGN.com vice president Tal Blevins agrees, "the video game industry is about fun and entertainment, we should have a show that reflects that." For more detailed Atomic coverage of the show, go to **www.atomicmpc.com.au**

NEWS

Atomic LIVE Forum, Melbourne Edition

**Another city, another great night of Atomic, tech and catching up.
David Hollingworth reports.**

On the 25th of July last month we held another very successful Atomic Forum. How successful? All you have to do is look at the rapt faces in the crowd, and the crazy hats. They make everything better. It was a great night, and we'd like to thank everyone who attended – behind and in front of the stage.

The night opened with a brief talk from Andrew Owen of Monash University (also a huge Battlestar Galactica geek, bless his cotton socks), talking about what his uni had to offer those interested game development. Then it was on with the featured speakers, who do a great job keeping the nearly 200-strong crowd informed and entertained.

First cab off the rank was the always interesting Nick Hodge of Microsoft evangelism fame. He talked about his love for lots of RAM, cats and small towns in Austria (long story, had to be there). Next up we were treated to a discussion of enthusiast and gaming grade motherboards, courtesy of Albert Liang of ASUS. After a brief look at the ROG series of overclockable motherboards, he treated us to a short video, then left the stage for Damian Scott from Primal Clarity Productions.

Damian talked us through the kind of development his company has been engaging in, from modding for existing games to creating the company's own content. And, of course, he also spruiked the importance of good education.

Our final set of speakers were Justin and Peter from Toshiba. Not only did they have a brand spanking

new laptop to tell us all about – the awesomely cool X300 gaming laptop – but they had both of the only two machines in Australia to show off. What's more, they even took one apart to show the gribbly working bits inside.

And afterwards everybody went downstairs to Mama Duke's bar for a drink and a chat. One of the great things about these Forums is the chance to see readers and forum types get face to face. It's a chance not only to get an insight into the technologies we all use every day, but to see the human face behind them.

Plus, it's an always welcome chance for us, the people who make the mag, to get some personal time with you, our readers. Sure, we might lose the odd game of foozball, but all in all it makes for one of the best nights of our working year. Atomic is about more than technology, and these nights embody the best of what we do.

The Atomic Forums will continue, so when one comes to your city you really owe it to yourself to attend.

NEWS
Game, industry and online news for the enthusiast

E3 2008: Games to watch out for

We had a man on the ground at the Electronic Entertainment Expo. **Christian Reid** reports.

E3 2008 is the Show. Held every year in Downtown LA, all the games developers and designers and publishers put on their posh frocks and debut everything to be released over the coming year.

Held in roughly three hundred degrees centigrade weather, in what appears to be a titanic glass cathedral, packed with thousands of gamers in hats and wacky t-shirts, the whole thing stretches over hundreds of metres. Seeing every game out there, well over a hundred, is impossible. Here's the best of, or most promising, of what we saw.

Bioshock PS3

The long-rumoured and long-awaited port from Xbox over to PS3 is official now. There are four studios contributing to the PS3 version, working to give the visual elements a once over. We'll also see contents and new puzzles and enemies. The only new element on display so far is a downloadable arena. A Little Sister is stuck atop a Ferris wheel and she needs rescuing. Through a series of puzzles, you'll have to move the Ferris wheel to get her down. That sort of thing will be the big appeal for Sony fans. It looks exactly like you'd expect a PS3 title to; the game is as sharp and as atmospheric as always.

Darksiders: Wrath of War

Dark Void

Cover was one of the buzzwords of the convention and Dark Void was one of the more interesting games getting in on the action. A third person shooter with a difference, Dark Void sees you grabbing a jet pack and flying around, looking to jack up UFOs and fight your way to freedom. The map design is quite odd, being built up vertically. The level on display was a series of huge cliffs with a base built into the side. There are four distinct kinds of combats. Most boring is regular third person run-and-gun. Then there are land based vehicles. What's really interesting is the air combat, both in jetpacks and in flying vehicles. The dogfights seem intense and engaging. So far it looks a tad jerky but that should be an easy fix. Now if they can just dump the boring bits and make it all flying, we'll be cooking with gas.

Left 4 Dead

NEWS
Game, industry and
online news for the
enthusiast

Saints Row 2

LT RT GANG VEHICLES

GANG STYLE

80s
Gangster
Sporty
Prephop
Pimps 'n Hos

Ⓐ SELECT Ⓑ RESUME

de Blob

If you were, well, a bit stupid, you'd call this a stoner game. It isn't. This Wii release from Australia's Bluetongue Studios is an odd kind of 3D platformer, where you must literally bring colour back to a city controlled by oddly threatening fascists. Designed with considerable cartoon charm, this is simply a great deal of fun, great for kids and hung over Sunday mornings. The interactive music mechanic, changing as gameplay does, is also quite unique, from cheery funk to mad bossanovas.

Fable 2

This could be the biggest revolution in the RPG genre in a long, long time… if it comes through. The first Fable promised the moon but delivered nothing more than an excellent sandbox RPG. The sequel looks like it could very well deliver, with a simple 'jump in' mechanism for multiplayer, a wide-open plot, greater social mechanics, allowing more interaction with family, friends and NPCs. There's a rather elegant, if very basic, combat system, allowing for hardcore and casual gamers alike to wade into the story.

Fable's art design is also worth mentioning, a kind of Middle Earth that has moved into a pre-industrial, Dickensian fantasy of top hats, pipes and sideburns. The only worry is that there'll be so much to do it may seem to be a bit rambling and chatty.

Fallout 3

This game recently received a ban in Australia. Hopefully some simple skinning will change that ludicrously wrongheaded decision because Fallout 3 looks bloody brilliant. A third/first shooter with considerable RPG elements (lots of quests, characterisation and a highly customisable avatar), the revered franchise looks to be in capable hands, bringing back a complex and fascinating Post-Apocalyptic storyline. The Vault-tec Assisted Targeting System slows the game down from real-time, allowing you to move into almost turn-based

combat, giving you the option to pick out multiple attackers and choose specific kills, like satisfyingly gruesome headshots. While all the pew-pew is hellacious fun, what looks to set Fallout 3 apart from everything else is the intense characterisation and immersive elements.

Darksiders: Wrath of War

Goddamn! If there's something that's gonna take on Kratos for violent supernatural combat, its Darksiders. Mashing together Zelda, Devil May Cry and even some MMO-like mechanics, Darksiders is an engaging bit of the old ultraviolence. Earth, ravaged by the biblical apocalypse, is a place of horrors. You play the Horseman War, stripped of your full powers and commanded to figure out why Revelations came early. Into the hellscape you go, looking for answers from both demons and angels. Darksiders is a triumph of visual artistry. Joe Madureira, a legend from the comic book industry, brings some of the goriest, grizzliest enemies ever seen in a game. Huge bat-winged devils, sandworms that tower over the main character and his mount of fire and shadow. So far, gameplay seems a tad button-mashing but this should be a load of fun.

Deadly Creatures

Here's an odd little game. The player controls two characters that are actually in an open conflict against the backdrop of a Fargo-like crime story. Those characters happen to be a spider and a scorpion. This is a bit of a detour for Wii games, which tend to offer up fun party fripperies or undignified action. Deadly Creatures is atmospheric and tense, really bringing home how huge the world is when you're an arachnid out for revenge. In its own way, you could call this a horror/survival rather than an adventure game. Surprisingly vicious, filled with bug evisceration and a simple but scaleable set of great moves, Deadly Creatures could be a surprise hit.

Gears of War 2

If you didn't play the first Gears, you're behind the ball. With a cool cover system, some scorching action and a good solid dose of biffo, Gears was a genuinely great third person shooter. The sequel looks to be correct all the flaws of the first game. There are a lot more weaponry, vehicles, monsters and a much wider variety of battlefields to play on. The cover system is also enhanced, allowing you to take enemies prisoner, using them as moving cover, called Meat Shields. Plus, you'll get to ride around on giant monsters, blasting locusts with heavy machine guns all the way. Look for a lot of new multiplayer options as well, with a particularly challenging five man team up where you'll be facing off against 50 waves of increasingly dangerous enemies. If you like it shouty and shooty, this is the game for you, baby.

Left 4 Dead

Zombies, for better or worse, are still going strong. However, if you gotta have them, you might as well have them as good as Left 4 Dead, the game that caused the most buzz on the convention floor. This is less the grim meat hook survivalist that something like Resident Evil presents and more a complex adrenaline-filled multiplayer game that rests strongly on team interaction and cooperation. Tense, filled with 28 Days Later style howling, shrieking, frigging scary zombies, this could be the new big wheel for horror shooters. It's been a long time coming but is very much the one to keep an eye out for. Especially promising is the ability for a player to jump onto boss enemies to really give the players a hard time.

Lips

A Karaoke game, Lips is going to be a huge singing-party game. At the moment, it also represents a bit of a conundrum for every armchair IP lawyer in gaming journalism. It's easy to dismiss this as Microsoft's answer to Sony's SingStar. It allows a lot more than just sing-along, with Rock Band style elements such as cymbals and percussion playable by both the six players who can sing at once online and bystanders with Xbox controls. There are also going to be duets and some pretty precise scoring based on pitch, correct vocals and harmonies. More interesting, you can plug your iPod or Zune into the console and stream your own music, letting you sing with whatever you like, although lyrics won't be supplied. Questions of IP law to the producers of this game were met with friendly silence. But silence still.

Red Faction: Guerrilla

Destructibility. That's what RFG is all about. A major departure for the franchise, RFG moves from first to third person shooter and takes up the storyline fifty years later. The once proud Earth Defence Force has devolved into fascism and general villainy. You must team up with friendly trade unionists to take back Mars. Yet another example of the sandbox

Velvet Assassin
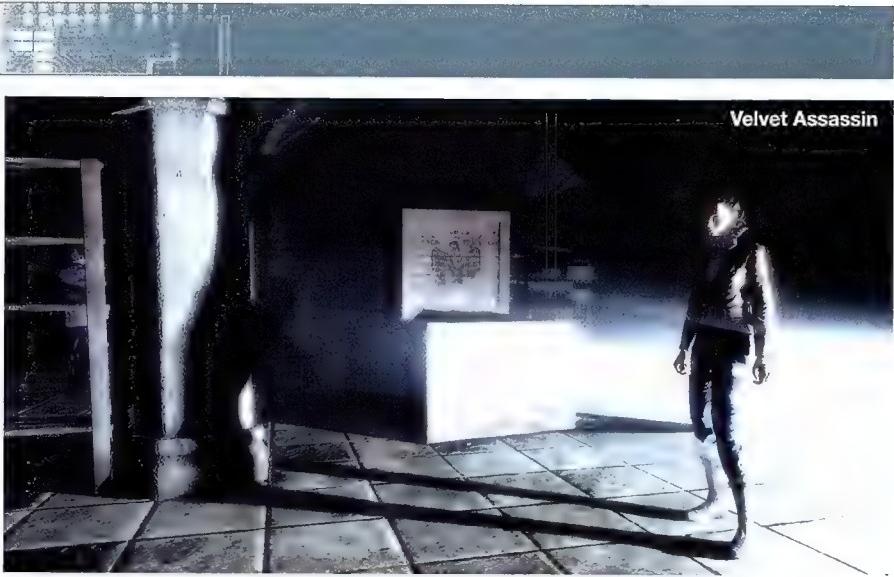
game, RFG sees you running and driving all over the red planet looking to generally frag buildings and bastards. That destructibility is the hallmark of the game, with a wireframe program running giving realistic destruction physics. There's also a whole swag of new weapons to allow you to go about committing said acts of explodey. Is it fun? Sure, but here's hoping that there's a strong narrative to keep you engaged.

Saint's Row 2

Do you want to play a sandbox crime-based game where you can beat a policeman to death with an IV drip? Do you want to machine gun bikers from the back of a jet ski while dressed up in a hot dog outfit? Do you want to make money by lowering property values after spraying white collar neighbourhoods with raw sewage? Do you want to grab civilians in a covering headlock and have contextually gruesome killshots? Why yes. Yes you do.

Velvet Assassin

There are a million games dealing with WWII action. There aren't many made by the Germans. Velvet

Assassin is a stealth shooter with a fascinating hook. It's set in Nazi occupied lands and looks to be very historically accurate indeed. Depressingly so, as the level we were shown took place in the Warsaw Ghetto, recreated from war time photos and littered with civilian bodies. Your SOE agent is looking not to free a fellow spy but instead get him cyanide. It's a tad low-fi, but might make up for it with atmosphere.

Warhammer 40,000: Dawn of War II

Surprisingly, DoW II moves even further away from its roots as a simple RTS in the blood-soaked and arcane 40K Universe. It has become far more about squad-based combat, customisation based on mission critical goals and taking and holding cover rather than the traditional base-building and resource capture. Indeed, there are even RPG elements in the game, as you'll only have small numbers of squads to finish your missions with. Lushly beautiful, this could be the absolute next step forward in the moribund genre. Fans of the game will be glad to know the absolutely staggering and violent animations are back.

Warhammer 40,000: Dawn of War II

ATOMIC X-RAY
Looking at tech from the inside
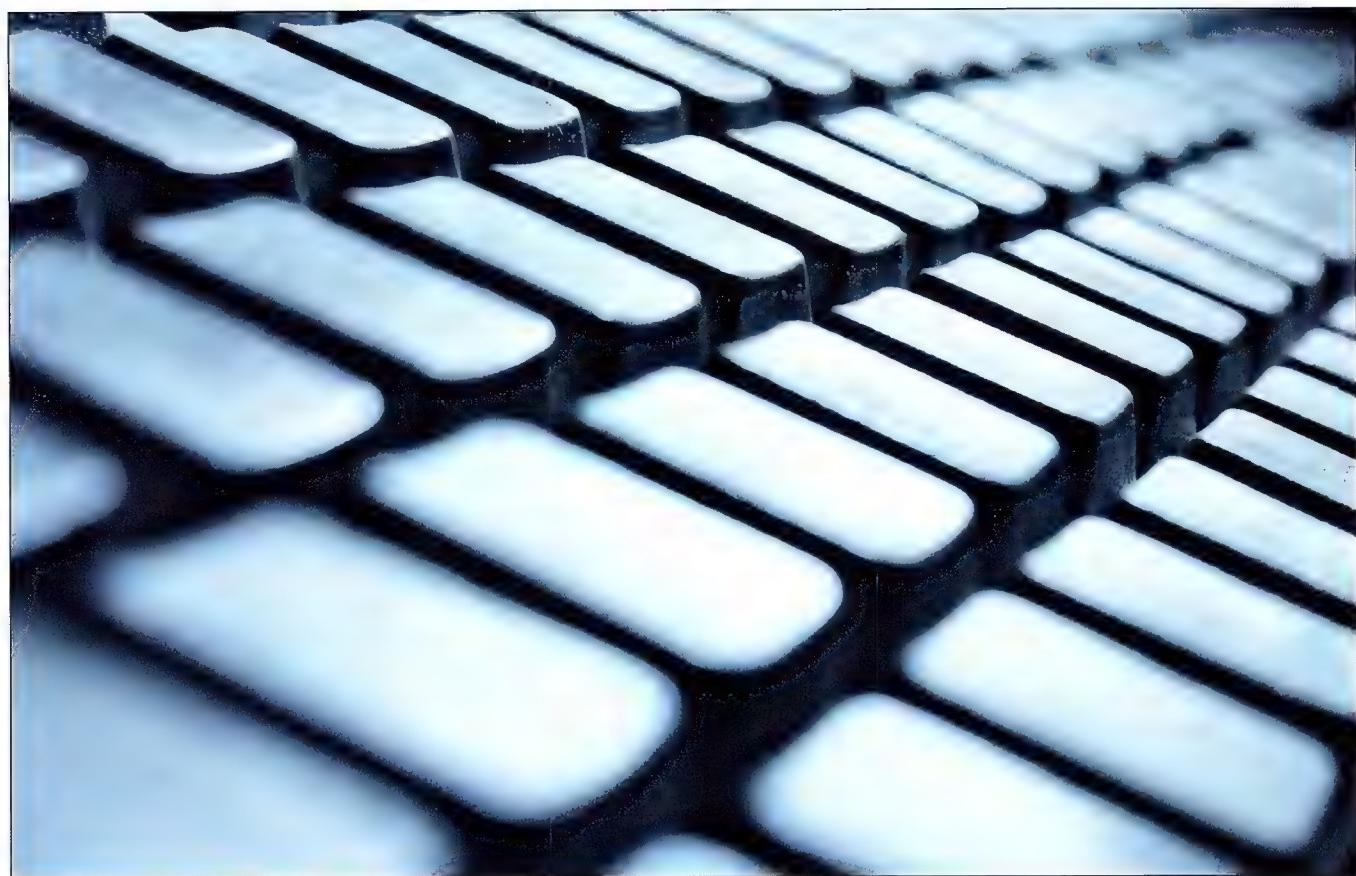
A key by any other name

Familiarity breeds contempt. Or, at least, forgetfulness. You've got a lot of keys on your keyboard, what are some of them doing there and where did they come from?
Ashton Mills taps the roots.

The funny thing about legends, myths, and traditions is that people keep propagating them from generation to generation until, one day someone asks "Why do we wear pink hats and jump up and down on Saturdays?"

Somewhere along the line, the origins were simply forgotten.

You may notice your keyboard has a lot of keys. You may even use some of them – but not all of them. Just what are some of those obscure keys doing there? And where did they come from?

Guns and typewriters

The origins of the keyboard we use today are steeped less in innovation and more in evolution. Which, funnily enough, explains some of the keys of a modern keyboard, inherited as they are from previous generations.

There is evidence that the concept of a typing machine goes as far as back 1714, where British engineer Henry Mill claimed he had developed an "Artificial machine for the impressing or transcribing of

letters, singly or progressively one after another as in writing... so neat and exact as not to be distinguished from print". No one knows if Mill got to build his invention.

It wasn't until 1867 that American engineer Christopher Sholes built the first practical typewriter (there were earlier attempts, but they didn't last). And he's the important one here – for machine schematics aside, Sholes is the one who is responsible for the layout of the keys that we still use today.

The machine Sholes built had a bit of problem – its levers for commonly typed keys would easily jam up. Initially the keys were laid out alphabetically, and an associate of Sholes by the name of James Densmore suggested splitting the keys up to *slow* a typist down and reduce the chance of this happening.

And that's exactly what Sholes did, creating the keyboard we refer to today as QWERTY – for the first six letters for the first row.

Little did Sholes know that one day his layout would be known for more than just QWERTY. For

many of us, it's the WASD layout.

Sholes, unfortunately, didn't believe his invention would be popular and sold it to the Remington Arms Company (yes, guns) which later mass-produced and marketed the first commercial typewriter in 1873. With a big company engine behind it, the mechanical typewriter became the next big thing. And from there the rest is, almost, history.

IBM and the 83 keys

In the end it would take IBM to popularise the QWERTY layout – first in its 'electric typewriters' which, no doubt, took the business world by storm (how *exciting!*) and later in its first personal computer, the IBM 5150 (aka the IBM PC), in 1981. Actually, Apple's personal computers were around before this with the majority of the QWERTY keys, but it's IBM's layout – and extra keys – that later became the de-facto. Indeed this is where some of the more esoteric keys on your keyboard began.

IBM's keyboards had other distinguishing features too – they were built to last, with the buckling-spring

operating systems: in Windows there's no feedback the capture has worked, but if you open Paint or another editor and Paste, the image will be added. In most Linux distributions it will take a screenshot and prompt you where to save it. Once upon a time however Print Screen sent a snapshot of the text console to a printer – which is why it's called Print Screen and not 'Screen Shot' like its use today. Could probably do with being renamed.

Scoll Lock: The Scroll Lock key was, like Print Screen, designed for terminals where it would act as a modifier for the cursor keys – when off the cursor keys would move the cursor on screen, when on the keys would instead scroll the contents of the screen. Today the key isn't necessary and could be removed, but like the Sys Rq key it's a tradition that persists.

Caps Lock: The Caps Lock key is a key we do still use today. Naturally it toggles the use of alternate CAPS for letters, performing the same function as Shift but without the need to hold it down. Unlike Shift however Caps Lock is a modifier only for letters, whereas Shift modifies other keys on the keyboard as well. Caps Lock originated with mechanical typewriters where it would lock the lever for the Shift key in place once Shift was pushed (so both keys pushed), to allow typing in all caps without holding the key down.

Num Lock: Like Caps Lock and Scroll Lock, the Num Lock key is a toggle and also began on the

mechanism made famous in the Model M keyboard in 1984. Each key was rated to be reliable for over 100 million keystrokes. Times change, eh?

While the first PC keyboard had just 83 keys and some improvements to layout, the addition of cursor keys, and the breaking out of function keys gave us the mainstream 102-keyboard we know today. These are hard to find now, however, as the 104-key keyboard has become standard. What are those two extra keys? The annoying 'Windows' keys, courtesy of Microsoft, that you always end up hitting mid-game right as you're about to frag someone...

Key legacies

So where does that leave us today? The 104-key 'Windows' keyboard sporting a QWERTY layout with some inherited keys held over from the dawn of personal computing. Some of the keys are re-mapped for modern systems, while others don't do much at all – but we keep making keyboards with them on because, well, we just always have. Let's see what the more esoteric keys are about:

Sys Rq: On its own in the 83 key layout, now also hosting Print Screen since the 102-key layout, the System Request key was originally used for the IBM 3270 mainframe and later IBM 5150 personal computer, mapped to a special BIOS routine. It was designed to invoke low-level operating system functions bypassing higher level programs – which is precisely how it's today used by Linux kernel debuggers when the 'Magic SysRq key' function is enabled, allowing developers to perform low-level

> ## "... it's IBM's layout – and extra keys – that later became the de facto arrangement.

commands regardless of the operating system's state. Aside from this however it is no longer used, and could be removed.

Print Screen: You know what this does, mapped to taking a screenshot of your desktop in most

original 83-key keyboard. Remembering cursor keys didn't arrive until the 102-key layout, Num Lock was used on the 83-key layout to toggle the number pad to act as cursor keys for navigation and vice versa. A function it still performs today, some 30 years later, although it's no longer necessary.

the etymology of the key. Originally it was used on typewriters to return the carriage – the cylinder around which the paper was wrapped – to the left side and roll the carriage around ready for a new line. This function was shown by the ↵ symbol, representing the physical action of the carriage return, and which you'll still find on Enter keys today – even though we're long past using carriages.

Interestingly it's been suggested that, despite the fact that some keys no longer serve a purpose, keyboards are still produced with the full layout because it's safer to do so than risk breaking software – however unlikely in modern systems – which might still use them.

That, or like pink hats and jumping up and down on Saturdays, they've simply become part of a tradition.

Pause/Break: Another key that could disappear and you wouldn't miss it, the original function of the key was as Break and has a history as far back as the *telegraph*. In personal computers it was used on the old BBC and Spectrum computers to interrupt running programs (and would do the same in DOS, when combined with the Ctrl key). It later inherited the Pause function in the 102-key layout, which can be used at BIOS POST and in DOS to pause text display on screen. While Break is rarely used now, today Pause is sometimes respected by applications (including games) to pause the current running operation.

Alt: The Alternate key harkens back to the 83-key layout and was originally used to set the high bit (first binary digit) of key sequence for use as a key modifier before the bit was usurped for internationalisation use in sequences. Still, it retains its function as a modifier today, and unlike the original 83-key layout with just one Alt key, modern keyboards have two, accessible on either side of the keyboard. On European keyboards, the right Alt key is titled Alt Gr (Alternate Graphic) and is used for characters specific to a locale, such as generating accented letters. Finally, in addition to being a modifier, the Alt key can be used to directly enter ASCII codes for characters – for example entering Alt-35 will generate a '#' under Windows, though values depend on the codepage being used.

Ctrl: Like Alt, the Control key is a modifier for other keys also brought forward from the 83-key layout. Originally it was used to produce non-printable control key sequences that would be picked up by a program to perform tasks like ejecting a page from a printer, clearing the screen, and beeping (hence the 'Control' terminology). Though unprintable, Control codes could none the less be generated with the right ANSI sequence and embedded in text – something IRC users will be familiar with. Naturally, you will be familiar with control sequences like Ctrl-C, Ctrl-X and Ctrl-V. Finally, like Alt, the original 83-key design had a single Ctrl key on the left side, whereas these days keyboards have a right Ctrl as well.

Esc: The Escape key generates the ASCII escape sequence that was originally used to signal a subsequent control sequence to a device. Or, said another way, the values following an escape

sequence would be interpreted as a command for a device, rather than as data. While it was originally used with terminals and modems, that purpose is moot these days. Instead the key is mapped to function depending on the operating system and application, but usually to exit or 'escape' the current mode. Escape sequences are still used however, such as in Linux terminals.
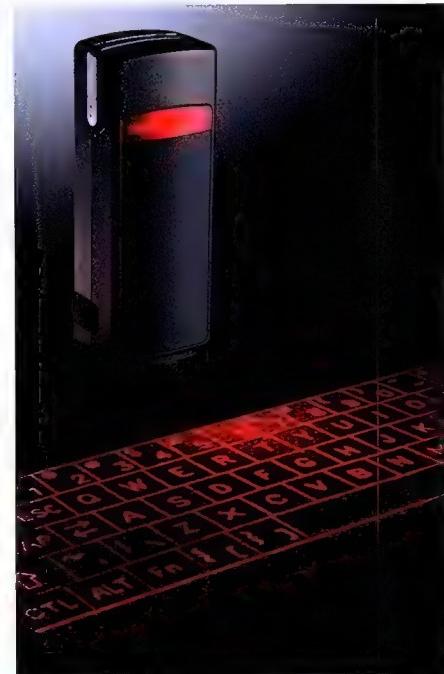
Function: The function keys are the only keys on the keyboard without a pre-defined operation, designed instead to be used by whatever application needs them. Originally they were located as ten function keys in a two by five row of the left side on the 83-key layout. Ostensibly this caused problems with programs that listed function actions horizontally on screen (for example at the bottom of a word processor), and so they were moved to the top row. The actions they are mapped to, despite the application, have since earned their place in history – F1 is commonly used to call up help in multiple operating systems, and we all know the value of F6.

Enter: You may think you know this one but there's a little more under the hood – interchangeable with Return, short for *carriage return*, this hints at

DVORAK AND THE DSK

With QWERTY being designed to prevent jamming on mechanical lever typewriters, why do we continue using it today in the age of computers? To be sure it's not the only option.

In 1936 August Dvorak patented the Dvorak Simplified Keyboard (DSK), which he designed to address the shortcomings of QWERTY, mainly typist fatigue. It wasn't just a random re-ordering; Dvorak studied the physiology of hands and letter use frequencies in words to come up with his layout. Some of his guidelines include common letters on the home row (middle row, where fingers rest) to be easiest to type; least used letters on the bottom row as they are hardest to reach; letters should be typed by alternating hands; and that the right hand should do more typing as most people are right handed.

The Dvorak keyboard layout. Easier on the hands, though it might confuse your WASD gaming.

Apparently, a typist can type around 400 of the most common words in the English language without leaving the home row, a number which averages 100 with QWERTY. Indeed the home row letters comprise some 70 per cent of the work for Dvorak, whereas the home row on QWERTY manages just over 30 per cent.

So why isn't everyone using Dvorak? Habit, and of course tradition (see the introduction to this X-Ray).

TECHNICA OBSCURA

The big picture behind technology and the world around us

Opening hardware

Ashton Mills love open source. He'd put it on chips if he could...

It began with software, and with source code, but the principles of open source are being applied to hardware as well – which may seem strange, at first. After all with software it's easy to collaborate on and distribute the product, but tangible hardware isn't quite the same story.

So what does a move to open hardware mean?

If you remember, one of the final hurdles for drivers under Linux are graphics. Most everything else is open source, which is why the kernel contains source code for thousands of drivers. But for graphics the trend to become open for NVIDIA, AMD and Intel has been a slow process – as I covered last issue, Intel and AMD are now actively involved in opening up either specifications or code, to varying degrees, while NVIDIA remains steadfastly silent.

While one solution is to wait for companies like NVIDIA to open up (which may never happen), another is to just build an open graphics platform to begin with – one for which the specifications, and the drivers, are released under the GPL.

That's the principle behind the OGD1 (Open Graphics Development) board, designed by the Open Graphics Project (**wiki.opengraphics. org**) and released in May of this year. While it's certainly no GTX 280 killer – and never will be, since its focus isn't 3D – it is however a completely open 256M dual-DVI graphics card whose specifications and drivers are open sourced. In fact, even the schematics and circuit layouts are open as well – downloadable from the Traversaltech website (**www.traversaltech.com**), the manufacturers of the OGD1, as a series of PDFs. If you've ever wanted to design your own graphics card, this wouldn't be a bad place to start.

Keep in mind with schematics freely available it's not just about having access to how the card works – others can take the design and improve upon it, as with open source code, and build an entirely new product. Something that might be helpful for producing cheap hardware in third world countries, for example. And just as with open source software, there are cost savings with open hardware too.

The OGD1 has something else going for it – the core chip is a Xilinx

> ## "... just as with open software, there are cost savings with open hardware too.

3S4000 FPGA, or Field Programmable Gate Array. In layman's, this means the operation of the chip can be re-configured on the fly, and could ostensibly be designed to perform completely different functions not limited to graphics.

Unfortunately, it's not cheap – the OGD1 is being marketed as a card for developers, not mainstream users, and clocks in at over $1000. But as the first of its kind, and perhaps a new wave of open hardware to come in the future, demand will in time create a market for affordable products. Additionally, as a development platform where hacking is encouraged, the OGD1 can be adapted to a wide range of market segments, from embedded systems to handhelds, and with it a potential cost saving that could be passed onto the consumer.

While definitely innovative, and a new take on the open source concept, it's actually not the first open hardware project. There have been others like the Simputer (**www.simputer.org**) and even open source CPUs such as LEON (**www.gaisler.com**), a specialised CPU developed for the Europen Space Agency. Indeed, the concept of open hardware goes beyond computing – the OSCar project (**www.theoscarproject.org**) has a goal to create an entirely open source *car*.

When it comes to tangible gear the open source philosophy probably doesn't work in as many areas as it does it does with software – being substantially more malleable and cost effective in distribution as it is – but it is very cool to see it expand to particular devices, like graphics cards, and could well accelerate a paradigm shift for other hardware that could benefit from being open.

And when that happens I'll be there welcoming it with *cough* open arms.

Ashton Mills would wear open source underpants if he could. Would you?
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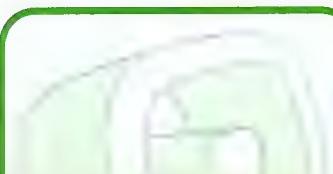
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Guide to AV cabling

Everything you ever
wanted to know
about how signal
becomes image.

I n the end, it all comes down to pixels.
Little dots of red, green and blue, smaller and more of them every year, are what drive us to upgrade and overclock, tweak and customise, whether it's a PC, home theatre, or some weird alien hybrid of the two. In the focus on tech specs and eyeballs though, it's easy to overlook just how those lovely, lovely pixels manage to get from there to here.

These days, digital is all the rage. This wasn't always the case. Back when Peter Molyneux was obsessing over Pong on the Atari 2600 that he stole money from his own grandmother to buy, a simple analogue RF cable was all you needed for pure

gaming bliss. Since then, video signals have been beefed up and pandered to with ever more capable signal standards and connections, and today digital signals dominate. Despite all the changes that have been made over the years though, video today is essentially the same as it has been ever since the introduction of colour. Red, green and blue signals are captured at one end, sent through a variety of media of varying bandwidths, and approximations of those same red, green and blue signals light up our displays at the other end. How they get from one to the other, though, really is a kind of magic. Magic of the 'maths and electrical engineering' variety, sure, but magic nonetheless.

AV CABLES
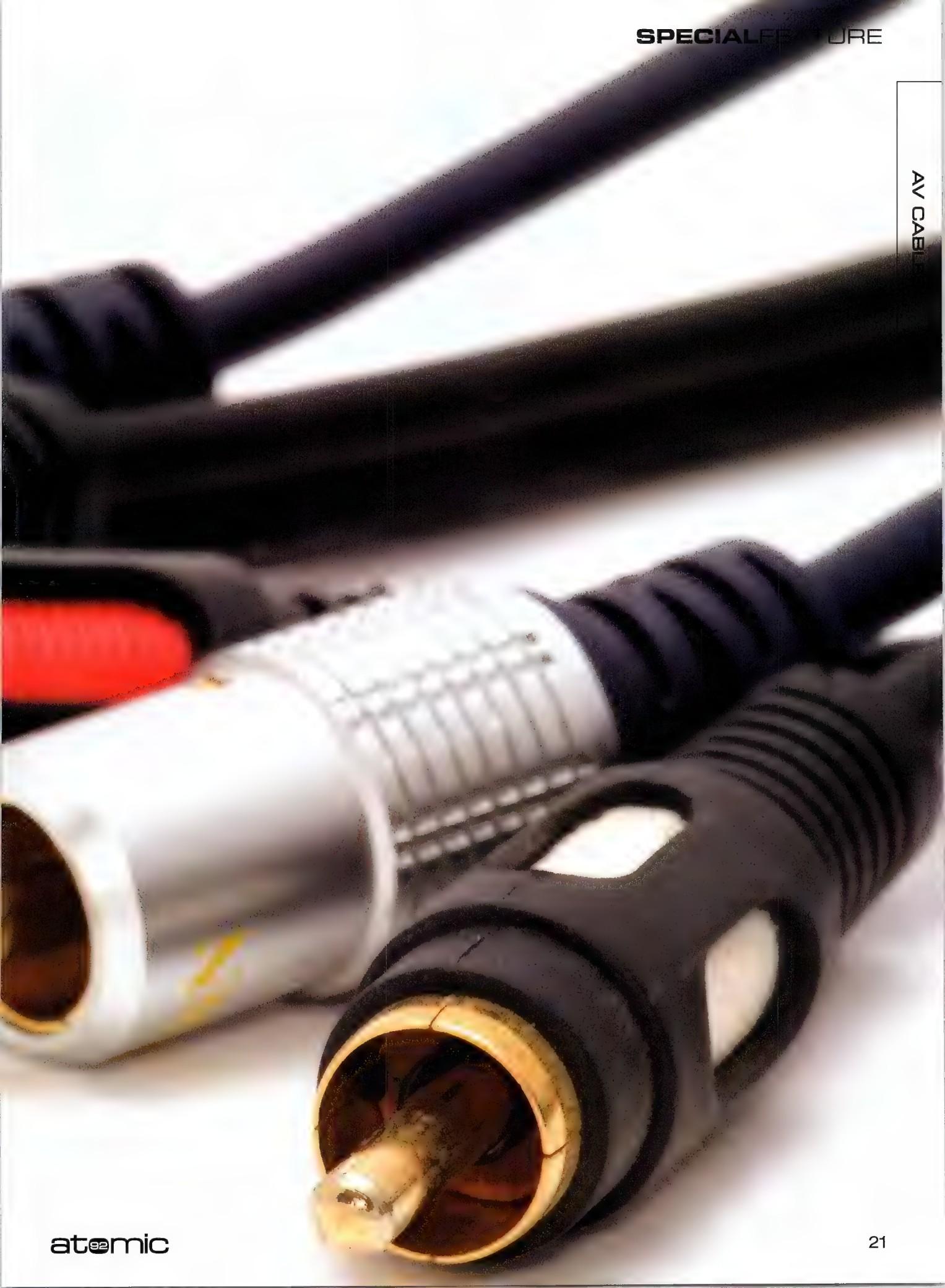
Analogue

Back in the days of the cathode ray tube, analogue made sense. Take a source video, break it up into red, green and blue, and modulate a pulse for each signal. The greater the voltage of any one part of the signal, the brighter that particular phosphorous dot would shine. Include an inverted-polarity section in one of the signals to tell the display that the rest of the signal was meant for a new line (or, with slightly more complexity, a new frame) and you have moving picture right there on your TV set!

Sounds easy, yes?

When dealing with the limited bandwidths that were available when colour displays were first introduced, however, there simply wasn't room for separate signals for red, green and blue. What we ended up with instead was 'chroma' and 'luma' (or chrominance and luminance for all you syllablephiles). An entire article could be written on these two little words alone (and, indeed, many have been), but to put it as simply as possible: luma is brightness, chroma is colour.

Luma is a signal value derived from a combination of the red, green and blue values, which when combined give us a black-and-white picture. The information is there and, crucially, is made up from red, green and blue values, weighted

> **If all of this seems like a complicated way to send red, green and blue colour signals, it's because it is.**

in such a manner that this purely black-and-white picture would appear 'natural' to a human eye more sensitive to blue than to red, and red than green. It is commonly abbreviated, for reasons arcane and mystic, as Y' (a raw, unweighted combination of these signals would be Y, more of which later).

Chroma is a signal comprised of two further

signals, U and V. Take your original blue signal value and subtract the Y' value, and you have your U. Do the same with Red and you have your V. Since the Red, Green and Blue values are encoded in the Luma, and the Red and Blue values are encoded in the Chroma, a bit of the kind of subtraction magic that analogue circuits can perform so well will give you the green. In practice, of course, it's quite a bit more complicated than that, but without wanting to fill this article full of numbers and algebra, the upshot of it is that in theory the initial R, G and B values can be extracted from the Y', U and V signals.

Composite vs S-video vs Component

Most everyone reading this article will have watched

N'SYNC

Every analogue video signal needs to have a sync signal embedded in it somewhere. The sync signal tells the display to start a new line or a new frame, and ensures that the electron beam travels back to the start of the line or frame without leaving an image on the screen. To do this, the sync signal must occur during the 'blanking interval' – a period of zero RGB values. Different connections embed the sync signal in different places, e.g. in the luminance channel, in the green channel, or on one or two separate wires. If the display fails to detect or use the sync signal properly, the image will distort. In the case of the horizontal synch, the display will 'skew' diagonally as each successive line is drawn a few pixels too early or too late and a portion of the image may appear at the edge of the screen back-to-front and stretched as the electron beam travels rapidly back to the other side of the screen while image data is being sent. In the case of vertical sync, the display will 'roll' up or down as each frame cumulatively includes or removes extra lines.

Digital signals still need this sync data and accompanying blanking space, but since there's no need to wait for an electron gun it is possible to achieve a substantial reduction in the blanking period, and the blanking period itself can further be used to carry non-video data, like audio.

a Y'UV signal at some point. Composite is well-known to everyone, that single little yellow plug that tends to give appalling picture quality. The reason for this is that a composite cable squeezes the Y' luma and UV chroma into the one cable. As the chroma signal interferes with the luma, the ever-common 'dot crawl' creeps in. S-video attempted to alleviate this problem of interference by separating out the luma and chroma signals into different wires (hence the four pins on the end of the one cable – a signal and a ground each for luma and chroma).

Both composite and S-video suffered from a terminal bandwidth problem, however. With most of the available bandwidth given up to the more-important luma data (which could still be used to generate a black and white picture), the colour resolution suffered dramatically. Component was an attempt to rectify this by further splitting the signal. To start with, since black and white TV is well and truly dead, component video was able to get rid of that pesky apostrophe, giving equal weighting to the red, green and blue potions of the luma, which was now represented by a Y. It then split the UV signals into separate Y-minus-blue and Y-minus-red cables, resulting in the YPbPr and YCbCr colour spaces that provide far greater resolution and colour accuracy.

PbPr and CbCr scale their signals differently to UV to achieve a 'natural' looking picture in the absence of a weighted luma value, but use the same principle – luminance subtracted from blue and red signal values. The difference between PbPr and CbCr is almost entirely irrelevant, with the CbCr originating from component's original use in professional equipment where it needed to deal with digital signals, before filtering down to the technically analogue-only PbPr. These days the terms are often used interchangeably and unless you have very old component equipment can be safely ignored.

Glorious RGB via VGA

If all of this seems like a terribly complicated way to send red, green and blue colour signals, it's because it is. RGB is a way of sending analogue video as three separate streams of red, green and blue data. It was also the way you saw pretty much everything on your computer up until you got that fancy new DVI-enabled video card and display. RGB comes in a number of variants relating to how synching is implemented – VGA uses RGBHV.

VGA started as a simple standard, and we still use the term to refer to the
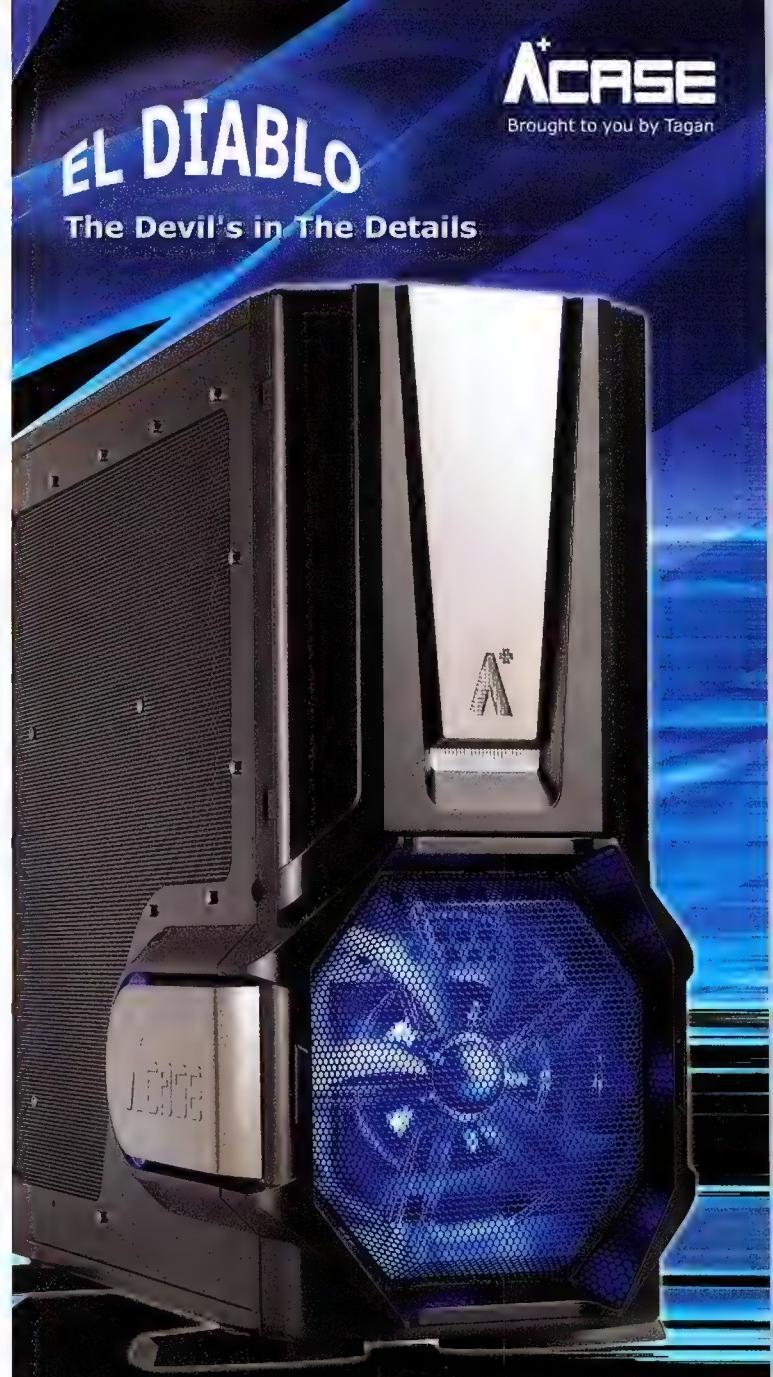
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video 640 x 480 resolution that it was intended to display. RGB is typically sent out over that trusty old 15-pin (DE-15) connector – forever known as the 'VGA' connector (for reasons that really should be obvious) – with three pins for R, G and B, two pins for horizontal and vertical sync (hence the RGBHV) and the rest of the pins used for grounding or not at all. Over the years, the standard has been tweaked and modified to the point where it is now capable of pumping out 2048 x 1536 at 85Hz (although you'd have a hard time finding a CRT to monitor to display that – there are none currently in production). Such longevity for such an old standard is really quite commendable, and a tenfold increase in pixels on screen is nothing to sneeze at.

Indeed, if you care to push it further there is no technical limit to the resolutions that VGA can support. As far as the connection is concerned, the maximum resolution is limited only by the available bandwidth, which is in turn limited by how fast you can switch from one value to another. In an analogue connection, this means that you need to allow time for your signal go from peak to trough to peak in the time it takes to scan from one pixel to the next. And sorry, but there's no choice but to resort to maths for this one.

Let's take a common resolution: 1280 x 1024, also known as 'SXGA'. We're talking bandwidth, which is data over time, so framerates matter – let's make it 60Hz, or 60 frames per second.

60 Hz here actually runs at ~59.895 Hz, and if we take the reciprocal of that we get ~16.7 ms to draw each frame, which consists of 1024 image lines plus the 39 blanking lines that allow the hypothetical electron gun to travel back from bottom-right to top-left without leaving a mark on the screen. Dividing the 16.7 by 1063, we find that each line has only ~15.7 microseconds to be drawn. That's the time in which 1280 (image) + 432 (blanking) = 1712 pixels need to be individually processed and delivered. A quick trip back to the calculator, and we get 9ns for each pixel to get painted. Take the reciprocal of 0.000,000,009 and you get a figure of around 109 MHz (or 109 million changes per second) for a signal with sufficient bandwidth to handle 12804 x 1024 @ 60 Hz. And that's per colour. As a very rough guide, with standard analogue timing (which will be either GTF (General Timing Formula) or CVB (Cumulative Virtual Blanking – not to be confused with Composite Video Blanking and Sync or CVBS)) you will need to add 50 per cent to the required bandwidth for a given resolution and framerate to take blanking into account, although this can vary up to around 70 per cent for some combinations.

Digital
DVI

Digital Video Interface (DVI for the short of breath) ushered in the consumer digital era, sorely needed with the proliferation of LCD panels such that they can now safely be considered ubiquitous. As a bridging technology, DVI does its job quite well. DVI comes in analogue and digital flavours (DVI-A and DVI-D respectively), along with an 'integrated'

variant that combines the two (DVI-I, natch). Both -D and -I in turn come as either 'single link' or 'dual link' – with dual link effectively doubling the available bandwidth for digital video – making a total of five possible connections for essentially the one cable. Such is the curse of intermediate tech.

When used as an analogue cable, DVI offers everything that VGA offered. Which should come as no surprise, seeing as it passes through the same RGBHV signal with a maximum bandwidth of 400MHz.

When conducting a digital signal, however, DVI becomes a little bit trickier. Instead of a modulated pulse, pixel values are transmitted as 30 bits of binary data – the signal is now either on or off. Each pixel gets 8-bits of data per colour, making DVI inherently 24-bit (8-bits each for red, green and blue) regardless of any other settings (although a dual-link connection can use the second link to provide up to 48-bit colour). To ensure stability of the signal voltage regardless of the image is all-voltage white or no-voltage black, each bit after the first bit undergoes either an XOR or an XNOR transformation, with a ninth bit tacked on at the end stating which operator was used (which is chosen according to which method requires the fewest number of bits to be changed). A tenth bit is then added to determine to polarity of the sub-pixel data, which again

is altered to ensure voltage stability throughout the data stream, resulting in 8b/10b, or 8-bits of meaningful data being encoded into 10-bits for transmission. This method of transporting the data, by the way, is known as TMDS, or Transition Minimised Differential Signalling.

DVI bandwidth

Knowing this, we can now starting working out the limitations of DVI resolution. DVI data rates are determined by an integrated data clock, and the maximum clock frequency is 165MHz per link. The use of a data clock allows for much more precise positioning of the pixel values than is possible with an analogue connection and results in the more 'crisp' image that some notice when using a digital link. Analogue signals on the other hand will occasionally result in 'peak voltage values – which is to say, the actual desired value – occurring at the edge of a pixel, or even intruding into an adjacent pixel. Again, DVI has separate channels for Red, Green and Blue, and each channel sends the 10-bits of data detailed above along the link with each cycle. This gives a nominal 1.6 Gb/s x 3 colours = 4.95 Gb/s per link, with 30 bits per pixel.

In terms of resolution, however, we really don't need to go much past the 165MHz figure. This is the number of pixels, including those required for blanking, that can be sent each second.

Digital blanking

As noted above, analogue video can require a substantial increase in bandwidth due to the necessity of giving the electron gun time to return to its starting position at the end of each line and frame. With a digital signal on a flat panel display, however, the blanking requirements are far less. With this in mind, a 'reduced bandwidth' solution known as CVB-RB was introduced with the requirement that a) the signal being transmitted is digital, not analogue, and b) the display is not a CRT. Where our above example of a 1024 x 1280@60Hz display required an effective resolution of 1063 x 1712 and 109MHz of bandwidth, a CVB-RB signal could get away with 1054 x 1440, reducing bandwidth requirements by a substantial 16.5 per cent to 91Mhz. In practice, this has allowed higher resolutions for any given digital link.

DVI is an extremely capable format for digital video delivery. At single-link, it can provide a 1920 x 1200 video stream at 60Hz, which is perfect for the highest of HD video standards on a 16:10 display. Add in a second link, and DVI can transmit 2560 x 1600 at that same 60Hz, or it can be used to transmit lower resolutions with higher colour accuracy. So don't get caught up in the hype – there are still few scenarios where you'll actually need to ditch your DVI in favour of HDMI.

HDMI

HDMI is, as most of you will know, a home theatre AV connection. In terms of video, the designers of HDMI saw no need to reinvent the wheel. Video data is sent in exactly the same manner as DVI, with RGB values encoded as 8b/10b data and transmitted using TMDS. HDMI offers only digital video, however – it does not offer the analogue option that DVI does. The advantages of HDMI are its ability to transmit data other than video, and its planned extensibility.

The original HDMI spec used the same 165MHz pixel clock as DVI, resulting in the same limited maximum resolution – 1920 x 1200@60. Perfect for HD video. Instead of wasting those blanking periods though, HDMI allowed for the encoding of basic audio data – up to 192KHz 24-bit 8-channel audio can fit in here. That's why they put the M in HDMI.

Since its inception, HDMI has undergone a number of revisions. And, truthfully, most of them are pretty much useless to you. Really. Here's a brief run-down of what each revision added, and why you don't need it.

Version 1.1: DVD-A
Version 1.2: SACD

Do you listen to DVD-A or SACD discs? Does anyone you know? Yeah, didn't think so. Oh, okay. If you're going to play either of these formats, you will need 1.1/1.2 gear. That's if you have a need to send these signals over HDMI, and given that even Sony seems to have given up on SACD by removing support for it from the base-model PS3 (i.e. the only model available here for the foreseeable future) these are very small concerns indeed.
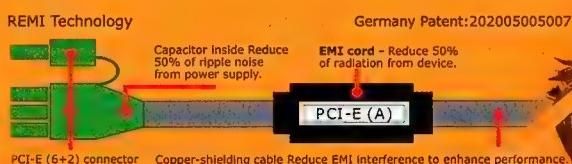
Version 1.3: DTS-MA/Dolby TrueHD support, 'Deep Colour'/xvYCC colour space support, higher bandwidth

Version 1.3 was a big update, with support for a number of new formats. Lossless audio was one big one that you really didn't need. DTS Master Audio and Dolby TrueHD are both audio formats that losslessly compress a 192/24 8-channel audio track. Which is great, really. However, if your Bluray or *chuckle* HD-DVD player can't already decompress these formats into the 192/24 8-channel PCM that HDMI has supported since version 1.0, it's likely that it won't be able to send the MA or TrueHD streams either. To put it bluntly: neither DTS-MA nor Dolby TrueHD provide superior quality over plain old uncompressed PCM – they exist purely to a) save space on the disc, and b) be marketable.

1.3 also provided support for 'Deep Colour' and xvYCC (see boxout). However, again, these are useless for most home theatre applications. Neither HD-DVD nor Blu ray are capable of playing back Deep Colour- or xvYCC-encoded content, and they never will be – to add these to the specs now would result in current players being bombarded with colour data that they have no idea what to do with. These may find some use in PS3 or PC games (Xbox 360 only supports HDMI 1.2) but probably won't, because a) implementing these would eat up system resources, and b) no-one cares. Which leaves camcorders, which are unlikely to make any noticeable use of colour depth greater than 24-bits due to the increased storage requirements, and are likely to use lossy compression for any xvYCC data they capture for much the same reason. But this is what happens when marketing drives tech innovation.

1.3 does have a couple of moderately useful additions, like better lip-synching between compliant devices, and a 340MHz pixel clock for higher resolutions and better framerates (if, that is, you have something other than your TV that's going to process the video data to >60 FPS), but these are still hardly worth throwing out any existing equipment to acquire.

HDMI 1.3a/b/b1: CEC update

HDMI 1.3a updated its CEC commands, which allow one device to control another connected device, which is kind of nice but unless you need the updated commands, you can do without this – CEC has been available in HDMI since version 1.0 (although wasn't broadly implemented, due to compliance concerns, until 1.2). 1.3b and b1 simply exist to say "devices that adhere to this spec comply with HDMI 1.3a" and should be either ignored or mocked.

All up, with HDMI we have an excellent signal transport mechanism that is quite capable of dealing with all current and future display needs. So far this article has only looked at single-link HDMI because, really, that's all that one uses, but the standard allows for dual-link much like DVI does, and could eventually allow for a 680MHz pixel clock (or a raw bandwidth of 20.8 Gb/s) if needed.

And if you learn anything about the world of technology, learn this: if there's no need for improvement, then improvements will be made.

> ❝ **Display Port is more extensible than HDMI, so we may see other non traditional uses of the bandwidth it provides.** ❞

The Future

For a while, it looked like we were going to have a new format war with two display interfaces being proposed: the VESA-backed DisplayPort and the Intel-led UDI (Unified Display Interface). That crisis has since been averted, however, with Intel switching to DisplayPort and UDI dropping off the face of the planet.

DisplayPort, then, looks to be the computer-enthusiast's choice for the future.

DisplayPort is designed to be a slightly different product to DVI/HDMI. It is intended as an all-encompassing solution, and can be used box-to-box (to connect computers to monitors) or chip-to-chip (internally, to connect laptops). It is also, like HDMI, intended to transport more than just video data, but goes much further than HDMI in this regard. DisplayPort will have sufficient capacity to transport a 6Mb/s audio stream of up to 192/24 8-channel sound. This is about 30Mb/s short of that needed for an uncompressed stream, but should allow a losslessly-compressed stream of, say, Dolby TrueHD, or at worst only minor compression would be needed. Unlike HDMI, however, DisplayPort has a dedicated 1Mb/s bi-directional auxiliary channel – a channel that, promisingly, could be used for, say, webcams or touch displays. Who knows, maybe Art Lebedev's next keyboard will connect via DisplayPort.

For all this though, the one thing it won't do is provide support for higher resolutions. DisplayPort provides four 2.7Gb/s lanes for a total raw bandwidth of 10.8 Gb/s. This is close enough to HDMI 1.3 as makes no difference. Future extensions of DisplayPort promise to double that bandwidth, but this will still only take it to a little over twice the theoretical capacity of dual-link HDMI. What it can do, however, is use the bandwidth it has a bit more flexibly.

DisplayPort is also more extensible than HDMI, so we may see other non-traditional uses of the bandwidth it provides. One possibility put forward by its proponents is the possibility of transporting multiple video streams, an application made possible by the fact that DisplayPort does not send a continuous stream of video data but instead delivers its payload via packets that can then be dealt with as needed. Further to this, version 1.1 of the specs allow data to be sent over fibre-optic cable. HDMI cables use copper and most can only be relied upon to send a full-bandwidth signal over three metres, and a reduced-bandwidth signal up to ~15 metres. With a fibre optic cable, there would be no problem running several of them around the house if you so desired, providing a different video feed to every room.

In the end, it all comes down to pixels – except when it doesn't. Millions of rowdy pixels shuffling around our bedrooms and living rooms will soon be sharing space with sounds, remote commands and all manner of data. The video wants and needs of consumers are changing rapidly, and it looks quite certain that we will have a solution to those needs every step of the way.

XVYCC AND DEEP COLOUR

Deep Colour and xvYCC are two terms that get bandied about a lot, especially when it comes to HDMI. They are also often confused as being different terms for the same thing, which they certainly are not. Just like 'True Colour' means 24-bit and 'High Colour' means 16-bit colour, 'Deep Colour' is simply a more marketing-friendly way of saying "more than 24-bit colour". That's it. With the 8-bits per colour of 24-bit colour, each red, green and blue sub-pixel can theoretically be in one of 2^8 or 256 different states of intensity, allowing for 16,777,216 possible colour combinations. If we double this to, say, 48-bit colour, then we end up with $2^{16} = 65,536$ states per colour, and a theoretical total of 281 trillion possible colours. Which is far more than anyone can distinguish, but hey, why not? Regardless of the bit depth though, red is still the same red, white is still the same white, and so on – there are just more colours in between.

In practice though, we don't get all those possible colours, because TV broadcasts, DVDs and Blu ray discs don't use all the colours available to them. To allow for the inaccuracy of analogue displays, only the intensity values from 16-235 (at 24-bit depth) are used, giving 10.6 million possible colours. xvYVV restores the full gamut of colours, allowing devices to display values as low as 1 and high as 254.

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HARDCORE

NEWS, REVIEWS AND ROUNDUPS ON THE LATEST HARDWARE

The times they are certainly a-changing this month, as we unveil a whole a new world of graphics chips from both ATI and NVIDIA. In true Atomic fashion we put them in a room together with a range of baseball bats, firearms and kittens and checked back a week later to see who was on top. We also performed the usual array of testing, and full SLI and CrossFire benching, to find the best new card for you.

OF course, that's far from all this month, as we have new mobos from Asrock and GIGABYTE to rock your socks, a whole mess of new 9-series cards from NVIDIA (yes, they're still coming), three very different takes on gaming PCs and all the usual peripherals and fun stuff.

HARDCORE CONTENTS
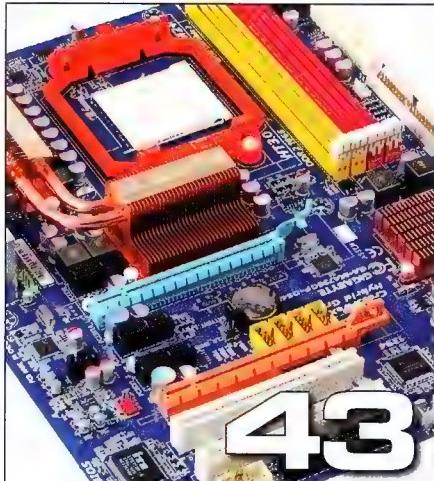
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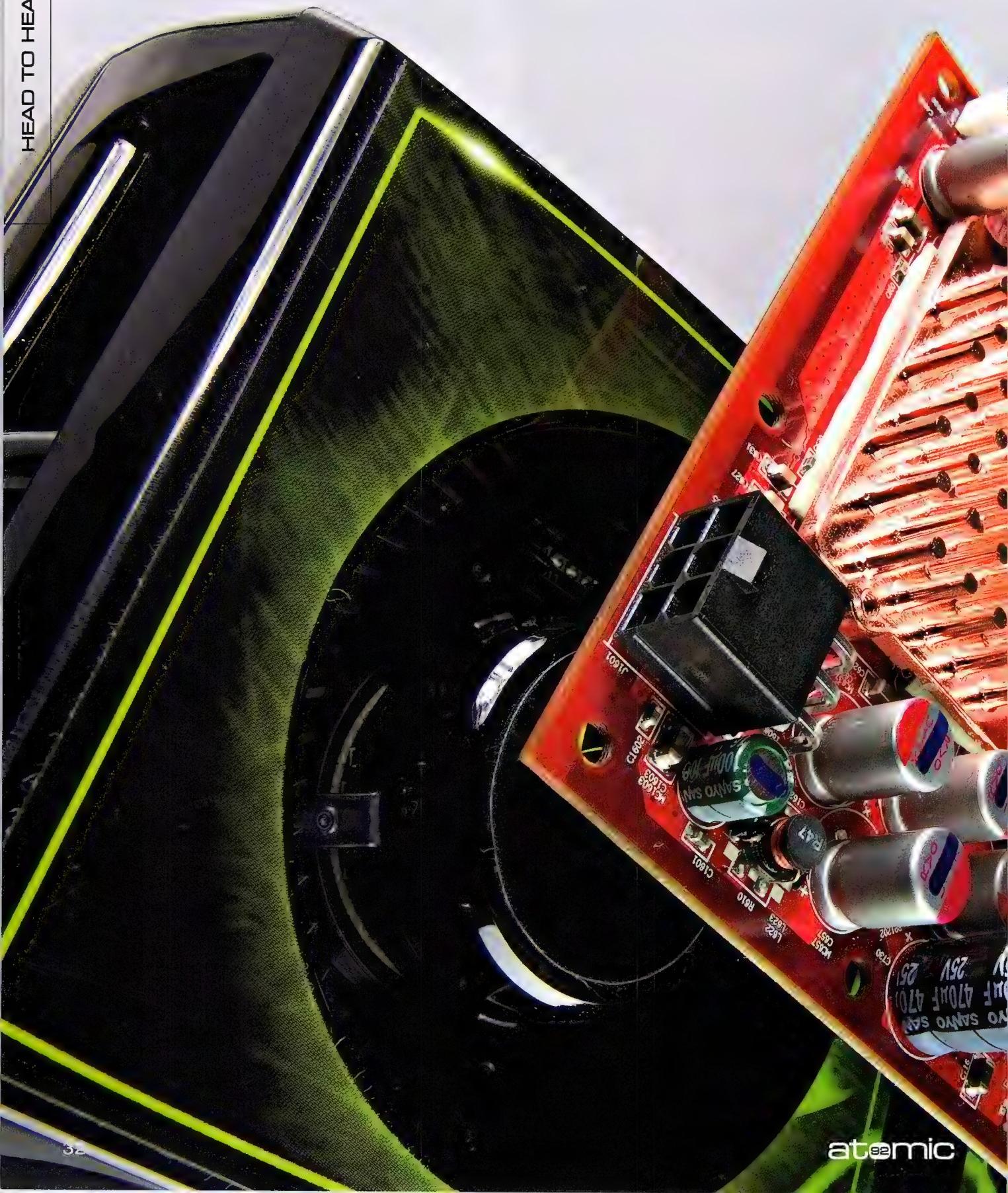
RED VS GREEN

Two old rivals. Two new chipsets. Incredible performance. Justin Robinson delves deep to find the new king of the heap.

N VIDIA has pretty much had the graphics card market to itself over the last few years. Sure, ATI has been steadily plugging away, but only with all the effectiveness of a slow third grader trying to lay a punch on a big playground bully.

Big Green has simply had the edge in hardware, in R&D, and in product cycle. Even the most rampant of fanbois was able to see that the one true performance solution for the PC was an NVIDIA-based set-up. PC retailers have certainly known where the edge is, as we've simply not seen a pre-built PC with anything other than NVIDIA cards.

But is all that changing? The retailers and builders seem to think so, as new systems are appearing that sport ATI's new 4-series cards over the good old green we've all become used to. Are the retailers on to something? Does ATI have the edge over NVIDIA's latest 200-series?

Well, we're going to find out.
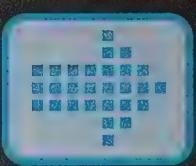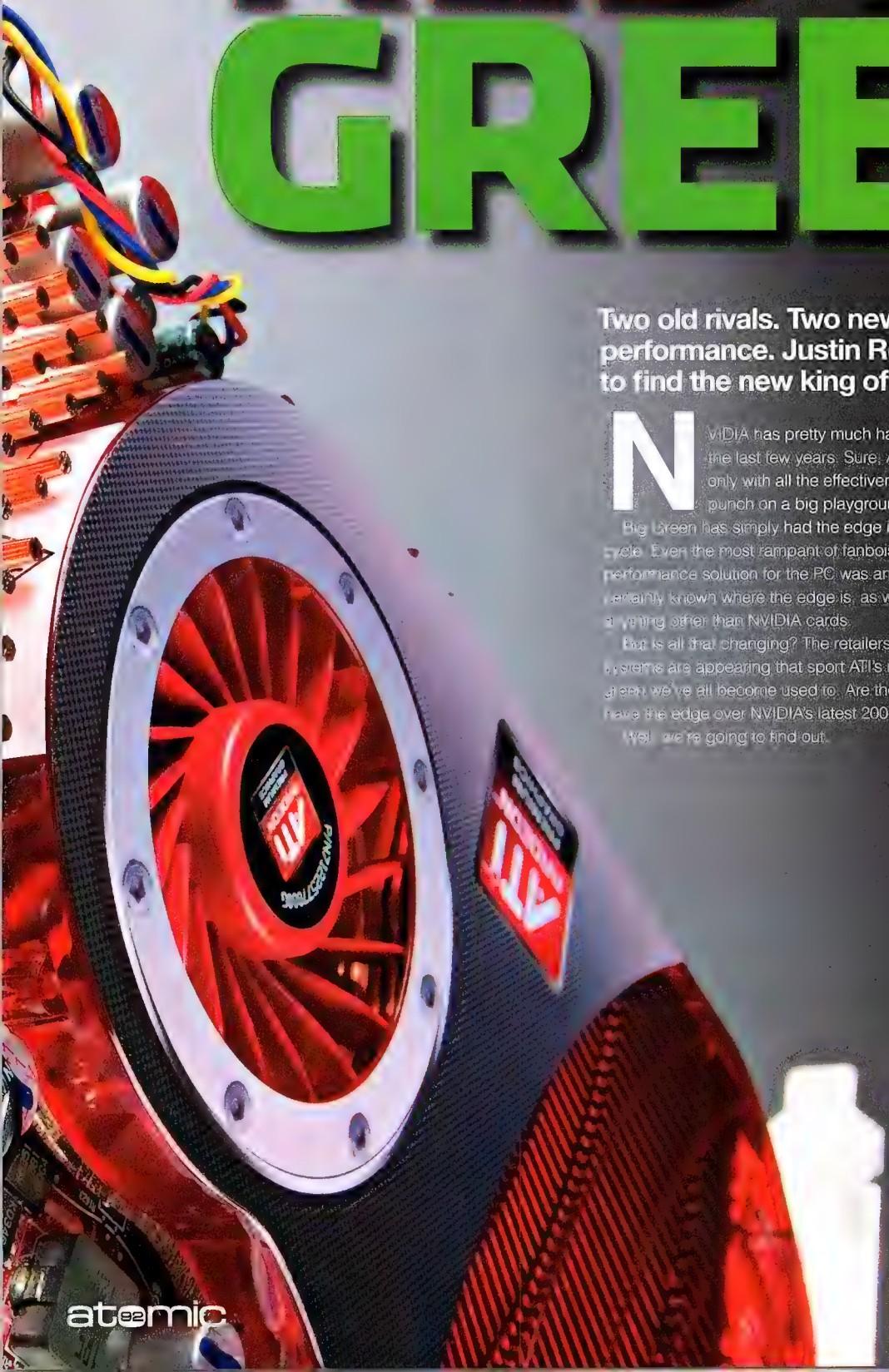
How we tested

Comparing two completely different graphics technologies is no mean feat, but with our array of tech – comparable to any computer store (and then some) – we managed to scrounge together two test-beds to give these cards a run through like never before.

SYSTEM SETUP

GIGABYTE X48-DS5 for Crossfire / ASUS Striker II Extreme (790i) for SLI

Intel QX6850 @ 333x 9 = 3000MHz

TeamXtreem DDR2 800MHz for Crossfire

Kingston DDR3 1333MHz for SLI

Antec TruePower Quattro 1000W

WD Raptor X 150GB

Thermalright Ultra 120 Extreme

Each system used similar components to ensure that results are easily compared, and the parts were chosen to reflect a common enthusiast's system. The operating system

Crysis and *Company of Heroes*. The 3DMark programs were left on default settings for ease of comparison, but *Crysis* and *CoH* were as follows:

- 1280 x 1024 resolution
- All options set to 'Ultra' or 'High'
- No AA
- No AF
- DirectX 10 was used in both games

The drivers used with the NVIDIA cards were Forceware 177.41, while Catalyst 8.6 was used for the ATI cards.

To get a better understanding of the total performance of these cards, as well as an idea of how they will work in your system, we decided to expand our testing. Using our magical soundstick (otherwise known as a sound-level meter), we placed it two centimeters from the center of the lowermost fan of each card. After we had stopped making noises into the end of it, and watching the decibels jump up and down, the desktop

> ## " ... we managed to scrounge together another two test beds to give these cards a run through like never before. "

was Microsoft Windows Vista Home Premium 32-bit SP1, with no audio or network drivers installed for either system.

Benchmark software installed on each rig was 3DMark 06 and 3DMark 03, as well as

idle noise was recorded, and load was recorded during test five of 3DMark06 (the dragon). Temperatures were also measured during the same points.
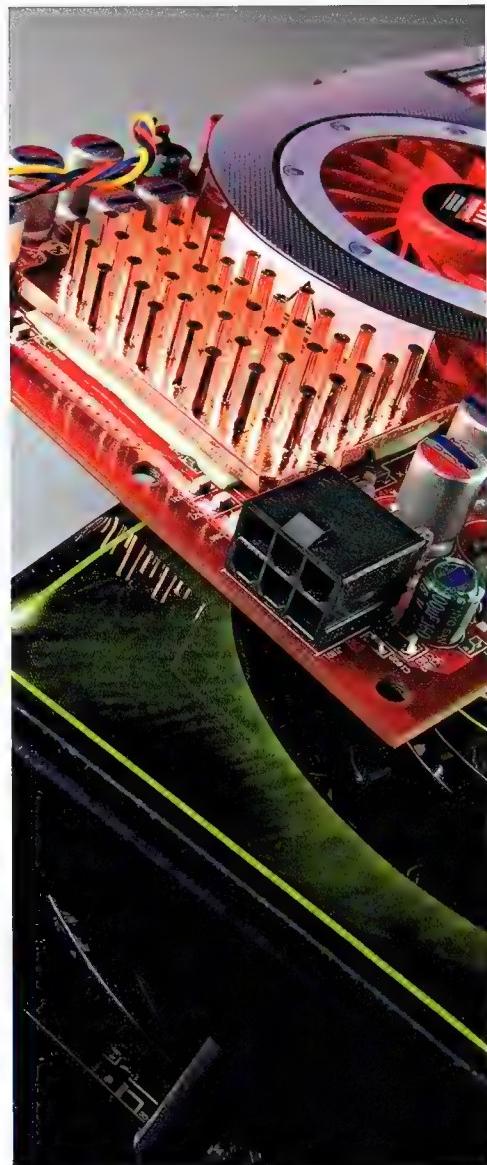
	Gigabyte GTX280	Leadtek GTX260	XFX GTX260	Sapphire 4870	Gigabyte 4850
Core code name	GT200	GT200	GT200	RV770XT	RV770 PRO
Stream Processors	240	192	192	N/A	N/A
Shader Units	N/A	N/A	N/A	800	800
Core Clock	602MHz	575MHz	640MHz	750MHz	625MHz
Memory Clock	1100MHz	1000MHz	1150MHz	900MHz	995MHz
Shader Clock	1296MHz	1242MHz	1363MHz	N/A	N/A
Memory	1GB GDDR3	896MB GDDR3	896MB GDDR3	512MB GDDR5	256MB GDDR3
Memory Interface	512-bit	448-bit	448-bit	256-bit	256-bit
Manufacturing Process	65nm	65nm	65nm	55nm	55nm
Power Connector	1 x 6-pin, 1 x 8-pin	2 x 6-pin	2 x 6-pin	2 x 6-pin	2 x 6-pin
Cooling Solution	Dual slot	Dual slot	Dual slot	Dual slot	Dual slot

GIGABYTE GTX280

A screamer of a card? Justin Robinson listens in.

Price **$760** Supplier **GIGABYTE** Website **www.giga-byte.com**
Specifications **602MHz core; 1100MHz memory (2200MHz effective); GT200 core; 240 stream processors; 1GB GDDR3; 512-bit memory interface; dual slot PCB with active cooling; one 8-pin PCIe, one 6-pin PCIe power connector**

Both vendors have just released their latest high-end cards, with this one being more than two times the price of the competitor's. Does the extra price result in extra performance? Well, not exactly.

This card from GIGABYTE is running on NVIDIA's newest GT200 core, a behemoth of a chip at 576mm², and made on a 65nm process. With 240 stream processors and 1GB of GDDR3 memory on a 512-bit memory interface, this card has the potential to completely outperform not only NVIDIA's other offerings, but also ATI's . A PCIe V2.0 slot is definitely recommended for theoretical bandwidth.

Protected under a glossy black dual slot cooler,

the card is adorned with a GIGABYTE sticker. At idle, this cooler keeps it at a very nice 42 degrees, at 56.6dBA. Under load, this increases to 61 degrees, and 60dBA, which is very cool compared to ATI's offerings. No game is offered with this card, however, only the standard cables, driver and manual.

The numbers are very disappointing for a supposedly high end card. Multiple drivers were used, and the CPU overclocked to alleviate any serious bottleneck, but nothing seemed to increase the GPU score. This is possibly a driver issue, and will most likely be fixed in later updates. Performance is similar to the GTX260, and in some cases actually worse. The GTX280 might eventually become a stellar choice,

if driver support is fixed, and games begin to stress it. You'll see the best use in resolutions above 1920 x 1200.

At this time, we can't really suggest this to anyone when you take a look at the wider market. At twice the price of the next model down, and more than twice that of its competitor, the GTX280 is currently a poor choice.

Crysis			CoH			3DMark06	3DMark03
Avg	Min	Max	Avg	Min	Max		
61.11	27.01	87.42	59.2	13.8	63.1	14880	50825

SCORE **7.0** OUT OF **10**

Leadtek GTX260

Leadtek leads the way for NVIDIA. We follow.

Price **$465** Supplier **Leadtek** Website **www.leadtek. com** Specifications **575MHz core; 1000MHz memory (2000MHz effective); 1242MHz shader clock; GT200 core; 192 stream processors; 896MB GDDR3; 448-bit memory interface; dual slot PCB with active cooling; dual 6-pin PCIe power connector**

Leadtek here presents a stock-clocked GTX260, a card squarely aimed at the enthusiast crowd. The latest in a slew of releases from NVIDIA, this card finds itself in a market that is already saturated with choice, so let's see what Leadtek have done to set this offering aside..

The card is based on a cut-down version of the GT200, with only 192 stream processors and 896MB of GDDR3 on a 448-bit memory interface. This is still significant, and bandwidth here is more than enough to keep the core working hard. A PCIe 2.0 slot is not as essential with this card, though it certainly can't hurt to have one.

Enclosed in glossy black plastic armour, and a robotic blue warrior from beyond on it, the cooler manages to keep idle temperatures at 43 degrees at 56.5dBA. Load increases those figures to 62 degrees and 57dBA, which is practically indistinguishable from idling. The cooler is very solid, but does attract fingerprints (very important if you have a windowed case you like to show off to the ladies). Leadtek bundles in a copy of Neverwinter Nights 2, which is a very welcome inclusion, and includes all the cables that you need to get set up and running.

The performance of the card is also quite good, with respectable scores returned across the board.

While it's nothing groundbreaking, it is enough to offer a very nice gaming experience, has along with some headroom to overclock.

The Leadtek GTX260 is a good card, which is let down only by the large price tag. With rumours of price drops on the horizon, it's possible that the card will become very good value in the future.

Crysis			CoH			3DMark06	3DMark03
Avg	Min	Max	Avg	Min	Max		
56.35	33.37	75.17	59.3	13.5	63.1	14382	45786

SCORE **8.0** OUT OF **10**

XFX GTX260 xXx Edition

Does the amount of X's in a product name effect performance? Atomic investigates.

Price $560 **Supplier** XFX **Website** www.xfx-force.com
Specifications 640MHz core; 1150MHz memory (2300MHz effective); 1363MHz shader clock; GT200 core; 192 stream processors; 896MB GDDR3; 448-bit memory interface; dual slot PCB with active cooling; dual 6-pin PCIe power connector

Another month, another NVIDIA (tell me about it! –ed) card. With product launches becoming less an event and more a routine, it takes something special to make a card stand out from the crowd. XFX is banking on just that, with their factory-overclocked flavour of the GTX260.

A mid-high end card, based on the GT200 core, this card has 192 stream processors, and 896MB of GDDR3 memory is running on a 448-bit memory interface. This allows a large bandwidth for the card, but results in a rather awkward amount of memory. PCIe 2.0 is also a good idea to ensure performance, though is not as essential with this card.

Clothed in a glossy black, dual slot cooler (endowed with a glowing green face, no less), the xXx GTX 260 idles at 42 degrees and 55dBA idle. The cooler manages to keep it at a very respectable load temperature 64 degrees and 57dBA, which is very quiet for a higher-powered card. In fact, the cooler is so good that the fan doesn't start up at boot, and turns on just after POST, when the card reaches a certain temperature! Also bundled with the card is a copy of *Assassin's Creed*, which is a very nice inclusion.

Results are a mixed bag, though. While performance in both 3DMark programs and Crysis is an improvement over the stock GTX260, Company of Heroes performance is simply not affected. Also notable is the same odd screaming issue found with the GTX280, although only apparent over 650fps (which 3DMark03 can hit), and not quite as loud.

For those who really want that guaranteed overclock, this might be a good choice. Unfortunately, though, the overclock isn't worth the extra money. Either way, this is a solid choice, bundled with a great game; the xXx edition will be a solid card for all current and future games.

Crysis			CoH			3DMark06	3DMark03
Avg	Min	Max	Avg	Min	Max		
57.8025	34.865	85.5875	59.3	16.0	62.1	14874	49044

SCORE 7.5 OUT OF 10

Sapphire HD4870

Does Sapphire's performance justify the upgrade? "Oh yes!", says Justin Robinson.

Price $325 **Supplier** Sapphire **Website** www.sapphiretech.com **Specifications** 750MHz core; 900z memory (1800 effective); RV770 XT core; 800 shader units; 512MB GDDR5; 256-bit memory interface; dual slot PCB with active cooling; dual 6-pin PCIe power connector

Opening the packaging to such a pivotal card (for ATI especially), releases a certain wave of high-performance silicon-enriched air that technology enthusiasts just love to huff. This particular card however, has that smell and oh so more.

The 4870 is the new high-end card, the current best in ATI's 4-series lineup. With the same 800 shader units as the slower 4850, the card has a whopping 512MB of GDDR5 memory, through a 256-bit memory interface, giving an amazing bandwidth of well over 100GB/s. A PCIe 2.0 slot is essential to get the most out of this card, and it will use every last piece of interface.

With a signature bright red cooler (complete with pistol-toting heroine), the 4870 idles at 66 degrees and 51dBA. Under load, this increases to 78 degrees, and 61dBA. While that sounds quite loud, it is a necessary speed, as the heat can be felt up to two feet away from the rear of the cooler. Sapphire does not offer a game with the card, but instead includes a full version of 3DMark 06, PowerDVD 7, and a limited edition 2GB USB stick.

The results here are amazing, considering that only a few months ago ATI was nipping at NVIDIA's heels. For only $100 more than a 4850, the price increase is definitely justified if you want great performance in current and future games. It can't compete with dual-GPU systems, but for a single GPU solution it's a very good choice.

This card is indicative of just how much the competition is ramping up between the two graphics card giants. As long as ATI keeps fuelling its R&D department, the company could well keep the performance crown squarely in the Red zone.

Crysis			CoH			3DMark06	3DMark03
Avg	Min	Max	Avg	Min	Max		
45.0175	25.23	66.8275	57.3	29.2	75.2	14457	49674

SCORE 9.5 OUT OF 10

Gigabyte HD4850

Can Gigabyte give ATI a much-needed hand? There's only one way to find out.

Price $299 **Supplier** Gigabyte **Website** www.giga-byte.com
Specifications 625MHz core; 993MHz memory (1986MHz effective); RV770 PRO core; 800 shader units; 256MB GDDR3; 256-bit memory interface; single slot PCB with active cooling; 6-pin PCIe power connector

For what seemed an age, ATI's offerings have been just that small margin behind the competition. Every ATI release would be met with another NVIDIA card, constantly putting the pressure on ATI, pressure that the company has not always been able to deal with. What NVIDIA did not expect, however, was that ATI's new core would be such a winner.

This is ATI's mid-high end card, based on its brand-spanking new RV770 core, the same as the 4850's older brother, the 4870. The card supports 800 shader units, and 256MB of GDDR3 memory running on a 256-bit memory interface. Connecting through a PCIe 2.0 slot on the motherboard, this card has more than enough bandwidth to push a metric truck-load of pixels.

Sporting a bright red, single-slot cooler, the 4850 idles at 61 degrees and 49dBA. This high temperature is due in part to the cooler's poor performance, and the slow-spinning fan. The flame design of the cooler is appropriate, as under load it soars to a face-melting 82 degrees, as the small fan struggles to keep temperatures under control at 59dBA. Make sure to be extremely careful while the card is running, as it is easily hot enough to burn fingers.

Gigabyte's offering comes without a game, but includes all the necessary cables, and a crossfire bridge, that are essential to gain full functionality of the card.

The numbers definitely speak for themselves, with the card performing exceptionally well for it's conservative price. While there were a few dropped frames in 3D Mark 06, this is likely due to driver issues, and we expect this will be fixed in future updates.

To sum up, this card is exactly what ATI needed to get back in the game, with a price to performance ratio sure to please.

Crysis			CoH			3DMark06	3DMark03
Avg	Min	Max	Avg	Min	Max		
44.615	19.98	63.413	43.6	18.9	61.6	12589	37006

SCORE 8.0 OUT OF 10

Crysis performance
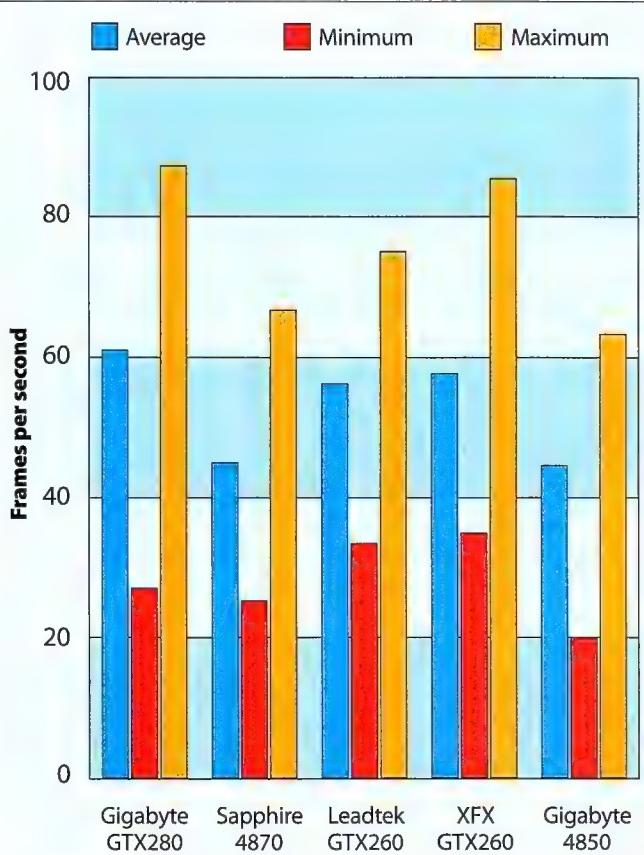
Company of Heroes Performance

3DMark06

Score (000s) — Gigabyte GTX280, Sapphire 4870, Leadtek GTX260, XFX GTX260, Gigabyte 4850

3DMark03

Score (000s) — Gigabyte GTX280, Sapphire 4870, Leadtek GTX260, XFX GTX260, Gigabyte 4850
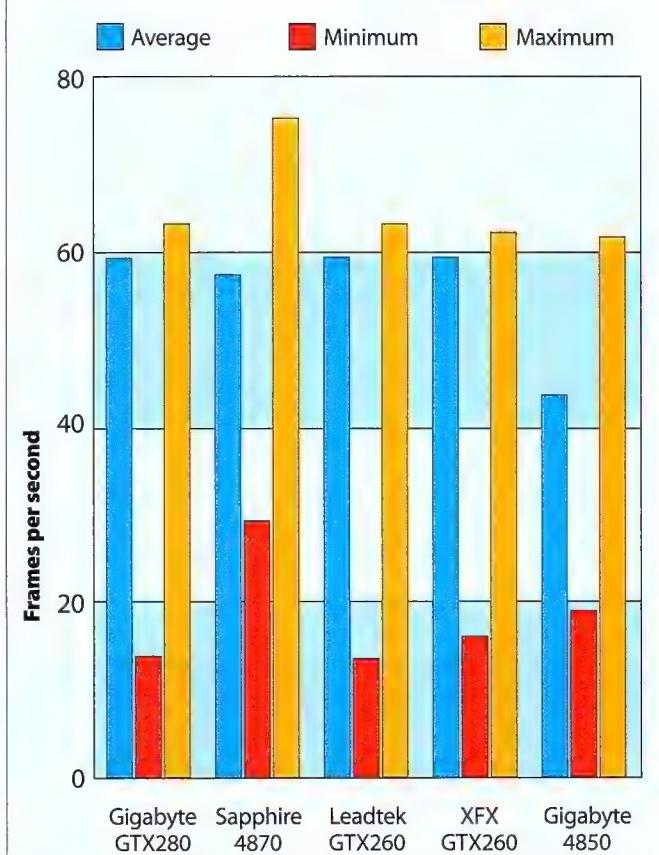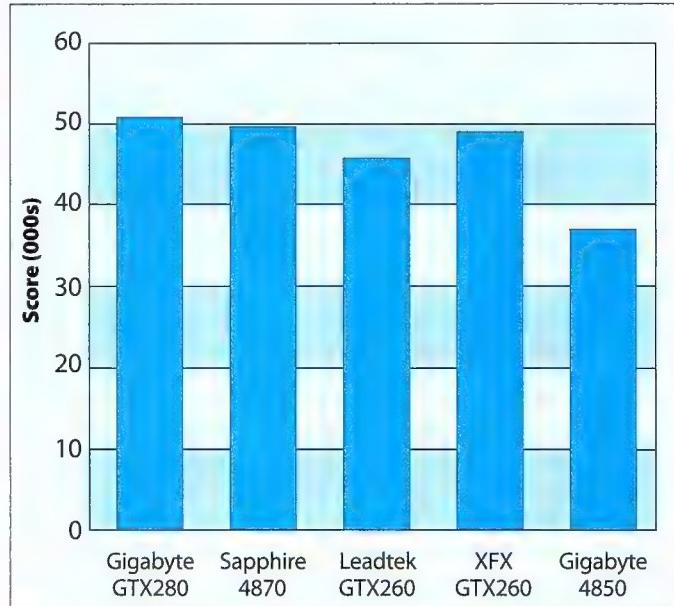
Crossfire or SLI

Two technologies compared, but which is the better choice? Justin Robinson emerges from a pile of graphics cards to discover the answer.

In the never-ending quest for maximum performance, there comes a time when a single graphics card just won't be able to perform. Even when overclocked to within an inch of its life, your card might have simply reached the maximum performance possible. The answer, of course, is not to increase the power of the card, but add another to share the workload.

Basics of multi-card technology
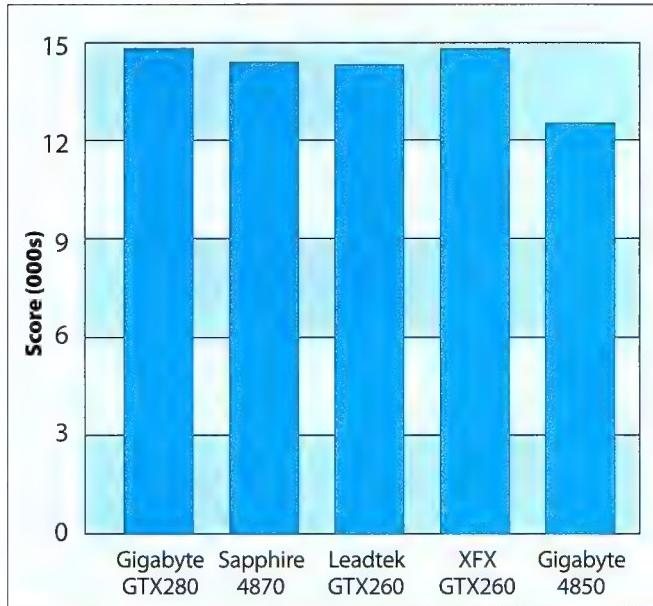
For many years, the two graphics giants ATI and NVIDIA have been pumping out cards, with each new generation offering increased performance over the last. However, neither company introduced SLI into the consumer market. The company responsible for this was 3dfx, where two Voodoo2 cards could be connected together. This technology was initially named *Scan-Line Interleave*, but 3dfx has since been purchased by NVIDIA, resulting in the new *Scalable Link Interface*, or SLI that we have come to know and love. ATI responded in turn with Crossfire, but both technologies have evolved quite a bit since the first application by 3dfx.

To enable the current technologies, two cards with identical graphics cores in the same series must be installed into a motherboard with dual PCIe X16 slots. NVIDIA cards can only be installed in nForce chipset mobos to gain SL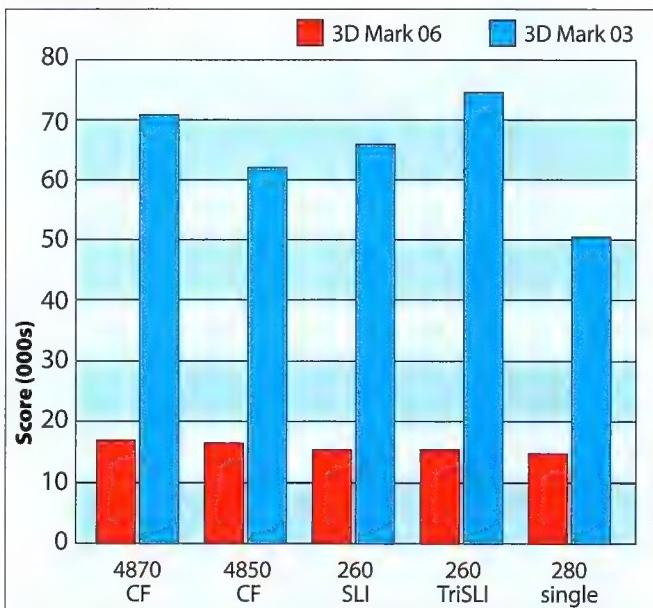I, while ATI cards can be installed in AMD or Intel chipsets. An SLI bridge must be used with NVIDIA cards, and two Crossfire bridges must be used with ATI cards. The reasoning behind this is that the PCI Express bus cannot communicate data at a sufficient rate, and needs this extra bandwidth to work effectively.

STRANGE BEHAVIOUR

Just like **Josh Collins** experienced in issue 91, we too had troubles with the GTX280 in SLI. As soon as any drivers were installed, blue screens of death and endless loops and hangs were discovered, and we did not have time to get it working.

3D Mark

Legend: ■ 3D Mark 06 ■ 3D Mark 03

Score (000s) — 4870 CF, 4850 CF, 260 SLI, 260 TriSLI, 280 single

Bottlenecks, Drivers and Slowdowns

With all high-performance systems, there will always be something that just can't keep up. When you introduce two (or more) high powered graphics cards into the system, often the CPU cannot send the data fast enough to keep them working, hence the term bottleneck. This can be alleviated with a simple CPU upgrade, or a basic overclock.

Drivers also play a big part in performance of multi-card systems, especially

Crysis performance

Average ■ Minimum ■ Maximum

Frames per second

| | 4870 CF | 4850 CF | 260 SLI | 260 TriSLI | 280 single |

Company of Heroes Performance

Average ■ Minimum ■ Maximum

Frames per second
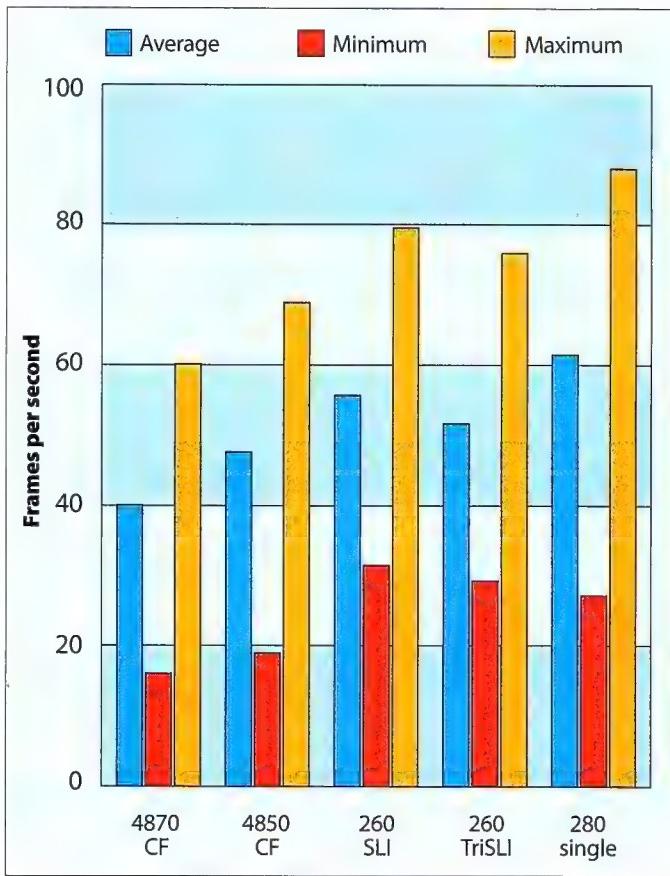
| | 4870 CF | 4850 CF | 260 SLI | 260 TriSLI | 280 single |
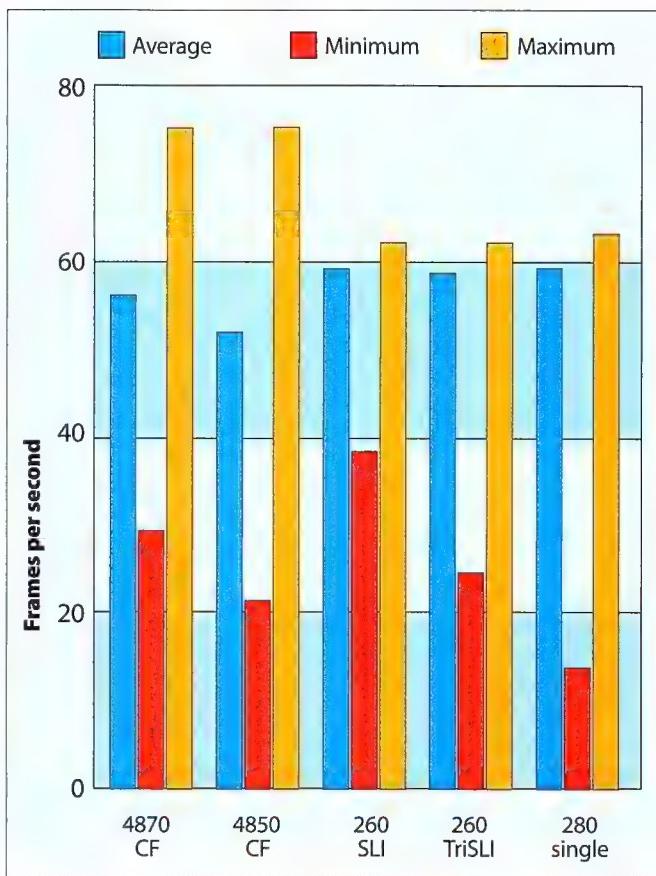
with Crossfire. As such, game performance will reliably increase when new drivers are used, so it's always a good idea to keep the latest driver installed and up to date for maximum performance.

Slowdowns, however, can happen for a multitude of reasons. It could be that there is something running in the background (such as an antivirus program), but often it is a physical issue such as heat. If you notice that the paint has started to peel off the wall where your computer is, then something is usually wrong!

Performance and Results

Run through our veritable gamut of benching, each configuration was put to the test (see "Strange Behaviour" boxout) to see the respective performance increases, and find out which one is the best for you.

Our first test, Crysis, places a significant amount of stress on the cards, even at a smaller resolution. Here, the SLI manages to pull ahead of the Crossfire setups, but this is easily explained. During testing for both the 4870 and the 4850, graphical errors would appear during random intervals, and performance seemed to be suffering due to these. A simple driver update would be all that they need to regain the lead. The fastest solution in Crysis, amazingly, turned out to be the single GTX280. TriSLI'd GTX260's, bottlenecked severely by the CPU, actually had a lower average score than two cards!

The second test was Company of Heroes, one of the first games to support Direct X 10 (albeit through a patch). Here we see that the SLI rig manages to have the highest minimum framerate, and anything over 30 frames a second is essential for maintaining smooth gameplay. Crossfire has the highest maximum performance, which indicates that future updates may further increase how well it plays. The GTX280 has the highest average framerate, but also dips to the lowest of all the cards, causing a jarring stop to the game, and reducing the overall experience. TriSLI again reduced the performance across the board.

Crossfire displayed its potential in both 3Dmark programs, with even the 4850 taking the performance away from the GTX260. TriSLI added only 18 points in 3DMark06, but added a more significant 8609 points in 3DMark03, which is more GPU-based. The single GTX280 cannot compete here against any multi-card setup.

Come on, feel the noise!

Surprisingly, the SLI rigs remained within 5dBA of their idle noise, even when under load. Temperatures were also very nice, with the hottest card only getting to 59 degrees. Crossfire, however, did not perform so admirably. With a load noise over 60dBA, the 4870's powered their way through testing, while making a noise akin to two bears wrestling. Apart from the noise, temperatures were over 80 degrees for the 4870s, and the 4850s reached an extreme load temperature of 88 degrees! Not only is this extremely hot, but it could lead to possible instability problems with other components, such as the CPU. Significant airflow is heavily recommended to keep these cards from toasting themselves into a fiery mess of silicon and circuit boards.

The bottom line

These two technologies are both very competitive in the performance stakes, but there is a clearly defined winner. SLI, while it does have very good performance, will cost you $900 for two cards. Crossfire, with even greater performance, can be had for as little as $500. Therefore, for an enthusiast there is no better choice than ATI this round.

Noise
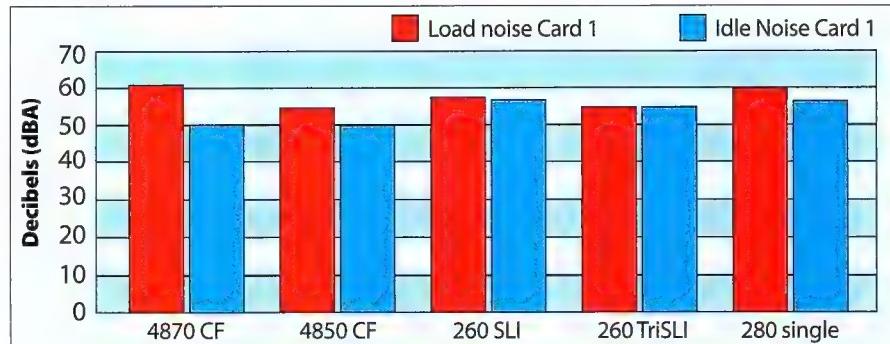
Temperatures
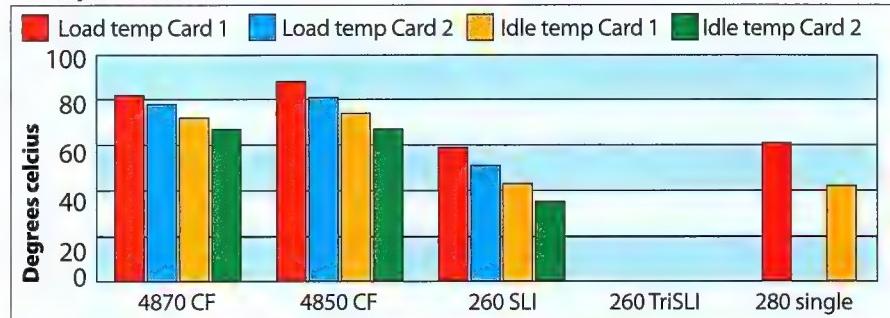
*Temperature sensor would not work with TriSLI

NVIDIA: Red in the face?

Ever since the introduction of the G80 core, NVIDIA has led the performance game at every turn. ATI seemed unable to match the rampant pace that NVIDIA set, and appeared to be always a step behind. With the release of their newest four series, ATI have once again regained the performance crown, but is it the best choice for you, the enthusiast?

The graphics market seemed dead for such a long time. With incremental releases from NVIDIA continuing to edge ATI out of the market, NVIDIA was banking on the GT200 core to completely crush anything that ATI could offer. What actually happened, however, was that ATI came out of the gates with guns blazing, offering the first desktop cards with GDDR5 memory and exceptional performance to boot. This translates into their Crossfire results, which are a marked improvement over SLI.

For games, there really is nothing better than rock-solid framerates. Running the latest game at a solid 60-100fps, with all the eye candy (and other candy) turned up is a feeling that everyone can enjoy, and Crossfire delivers in spades. SLI can manage very good performance as well, but if you factor in the cost of an NVIDIA motherboard, as well as the increased cost of the cards, then it becomes obvious that ATI wins – in the performance stakes.

Many enthusiasts don't mind having mini leaf-blowers in their systems, but for those who

do, NVIDIA cards are the winner. They remain very quiet, and still offer good performance. Temperatures are also extremely attractive (no, not in that way), with moderate cooling needed that most cases offer at stock. ATI, in comparison, is absolutely horrible in the amount of noise generated, which is the equivalent of having two people in a heated argument inside the case right next to you. Not to mention that the heat generated by two ATI cards is not only enough to warp cases and melt faces, but at over 80 degrees load for both four series cards, the case needs a significant amount of airflow, especially in summer.

One of the main determining factors for a dual-card setup is availability, as well as performance. Considering that a massive selection of boards are Crossfire ready, with only a few SLI motherboards to choose from, anyone can jump easily into Crossfire. ATI definitely wins here, since its platform is so accessible, and is very stable compared to some NVIDIA chipsets (just see the latest 7 series data corruption issues).

The area that ATI will always be held back by, sadly, is its dependence on driver support. Crossfire requires profiles that are bundled with Catalyst drivers to ensure that the games actually have improvements in them, and this could potentially be a problem for new-release games if ATI ever become lax on their updates. SLI has a performance increase in many games without driver support, and this increases once again with driver updates, needing less frequent development of them.

And the winner is…

You! With the graphics market becoming incredibly competitive, and performance at such a high and cheap level, high-end performance is accessible to pretty much everyone. When we get down to the nitty-gritty though, ATI and its Crossfire technology simply can't be beaten. Performance completely ousts NVIDIA, and SLI can't hope to keep up (as long as driver support remains frequent). As long as you keep them cool, two ATI cards in your system is the absolute best you can ask for in a performance rig right now. If you're a diehard green team player however, you'll be lacking in potential top performance, but still experiencing a decent speed.

Crossfire is Atomic's choice of multi-GPU tech with this latest round of cards, and it seems that the performance crown has been passed.

THE RUMOUR MILL

Rumours have been sighted around the internet about the defection of two major NVIDIA partners, XFX and EVGA. The interesting part is, they haven't signed on with ATI, but with a third party. We can only guess that Intel's new graphics core (the Larrabee) is the possible culprit, but for now we're not hearing a peep from EVGA, and XFX told us that they have many new NVIDIA products in the pipelines over the next couple of months. We'll keep you updated on www.atomicmpc.com.au if any more information is discovered.

ZERO.

That's how many employees will be able to work when your aging UPS battery fails.

A battery warning from your partner in reliability

When you bought your UPS, you chose it for critical uptime to protect your network applications. So as the industry leader, it's our job to inform you that an aging UPS battery puts your network reliability and your peace of mind at risk. If you are converging and consolidating your networks, upgrading your equipment, or deploying new servers, be warned: an older UPS simply cannot handle the increased loads and criticality — putting your entire network at risk of costly downtime, unsafe shutdowns, and data and equipment loss.

Luckily, there is a simple solution for renewed peace of mind — Trade-UPS. With the Trade-UPS program, you can trade in your aging UPS for a new APC unit and receive a rebate on your new purchase, plus more runtime and enhanced manageability of networked power and cooling. Not only will you see improvement in performance, you'll also see improvements in your utility bill.

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Upgrade today to receive your Trade-UPS rebate!
(To upgrade today see the three easy steps to improved power protection!)

The three easy steps to improved power protection.

Upgrade your old UPS - beat downtime, save money AND help protect the environment.

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- Serial number
- Capacity in volt/amps (VA)
- Number of units

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- FREE environmentally friendly disposal of your old UPS

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APC
by **Schneider** Electric

Asrock K10N78hSLI-WiFi

Justin Robinson collapses while attempting to read the motherboard name out loud…

Price $85
Supplier Asrock
Website www.asrock.com
Specifications Socket AM2+; NVIDIA 8200 chipset; ATX form factor; 1x PCIe x16; 3x PCI; 2x PCIe x1; 1x EIDE; 6x SATA; 2600MHz FSB; DDR2-1066; Wireless.

Asrock has been around for a few years now, providing budget builders with motherboards that are most definitely affordable, but still attempt to offer a wealth of features. Their slogan, if you will, 'Motherboard, We Master It', certainly proves the company's enthusiasm. Does it have solid performance to back up this claim?

Using the relatively new NVIDIA GeForce 8200 chipset (which contains an integrated graphic processor), a display output is strangely omitted. This means that a graphics card is essential, and is something that should have been properly thought through. The back panel supports the usual bevy of inputs, including firewire, optical, and an eSATA port. Asrock is known for its corner cutting, and has mutilated this port, requiring a SATA cable to be used as an extension. This means that an internal SATA port is lost, and a cable must be slung across the motherboard, disrupting airflow and possibly interfering with graphics cards.

The area around the CPU socket seems relatively uncluttered, but the poor placement of both the 8-pin and 24-pin power sockets is atrocious, taking up valuable space that could be used for a larger aftermarket cooler, and having two thick cables in the direct path of the airflow is never a good idea.
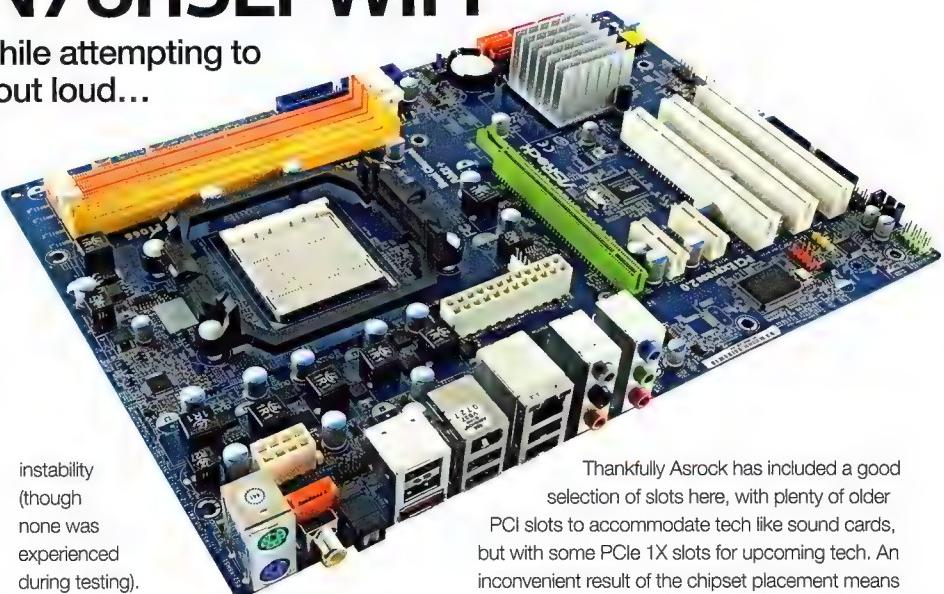
instability (though none was experienced during testing). Oversized modules can only have a maximum of two installed, as there is simply not enough physical space for them. The RAM slots are placed high enough up on the motherboard to allow for the removal and upgrading of modules when a graphics card is installed, at least. Thankfully Asrock has given the IDE and SATA ports a similar amount of thought, and placed them on the edge of the board. None of these ports will be blocked by a long graphics card, which is always a big plus, especially in smaller cases where there is limited space to move.

USB headers populate the lower right hand corner of the board, with the front panel connectors along the bottom edge. Also located here is a fan header, useful for connecting front intake fans. A

Thankfully Asrock has included a good selection of slots here, with plenty of older PCI slots to accommodate tech like sound cards, but with some PCIe 1X slots for upcoming tech. An inconvenient result of the chipset placement means that one PCI and one PCIe 1X slot will be blocked if any card is installed that is slightly large (any soundcard, dual-input TV tuners).

For all the eccentric design choices, there is one that stands out as a good feature – solid capacitors. Offering higher performance, and better longevity, solid caps are always welcomed with open arms.

While testing this board, we realised that the 8200 chipset supported Hybrid SLI! This technology allows you to pair the integrated graphics with an 8400, 8500 or 9800 card in SLI to theoretically allow greater performance in games, and (if the motherboard actually has the display output) the capacity to turn off the graphics card to save power when performing normal desktop tasks. Delving into our Giant Pile of Tech™, we emerged victorious, clutching an 8500GT in one hand, and the carapace of fallen beasts in the other (the tech labs are quite wild). Sadly, the performance of Hybrid SLI was underwhelming. Slight decreases in 3DMark03 and Company of Heroes were paired with increases in 3DMark06, and a large increase in Crysis. It really does depend on the program. Keep a close eye on the chipset temperature as well, as during heavy load it was hot enough to burn fingers – good airflow is a must.

Performance of the CPU was on par with what could be expected, but overclocking capacity was limited. A wall was reached at 232MHz, and no amount of extra voltage could push past this.

In the end, this board is a good choice for office systems, or even a cheap system for the home, but it's not for overclockers or enthusiasts. With a decent layout and interesting features, Asrock has a bargain basement offering that won't hurt the wallet, but may frustrate in the long run.

" For all the eccentric design choices, there is one that stands out as a good feature... "

This is an extremely bad location for those with PSUs at the bottom of the case, with most 24-pin and 8-pin cables not having enough length to actually reach the sockets!

Moving just past the socket, there are four slots for DDR2 memory. For normal sticks of RAM, there might be issues with heat pooling in the very small space between the modules, possibly causing

floppy socket is included at the bottom edge in a rather inconvenient place, though. Considering that floppy drives are becoming rarer, this isn't too horrible, and is certainly functional. The HD audio header is placed in the lower left hand corner, a good location for easy connectivity.

Expansion slots are a funny beast. Too many of the one type, and you start losing out on other slots.

	Crysis			CoH			3DMark06	3DMark03
	Avg	Min	Max	Avg	Min	Max		
8500GT	55.21	34.4	61.1	42.9	5.9	61.1	3703	11705
8500GT Hybrid	67.84	36.82	105.47	41.7	5.8	63.1	3847	10550

NB: Game tests were completed at lowest detail settings to emphasize performance difference. 3DMark was on default settings.
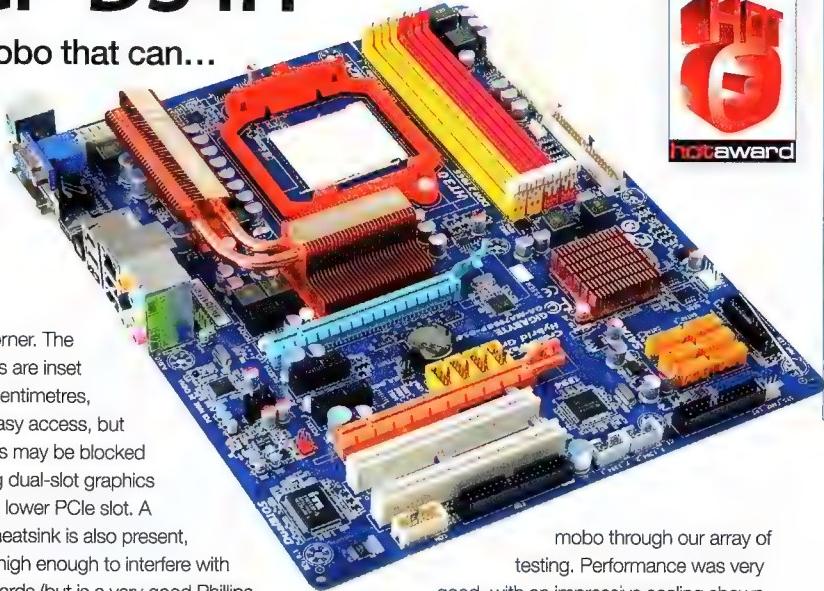
SCORE 5.0 OUT OF 10

Gigabyte 790GP-DS4H

Justin Robinson investigates the mobo that can…

atomic hot award

GIGABYTE has long been an excellent company, with products flying off the shelves with enough copper to create a giant copper rollercoaster. Known for its elaborate cooling solutions above and below the motherboard, this particular offering is rather conservative.

Powered by the brand-spanking new 790GX chipset, this board has a Radeon HD3300 built into the motherboard! Outputs are very good, with VGA and a choice of either HDMI or DVI, meaning that multi-monitor support is possible with just the mobo. Four USB ports, audio, PS/2, Firewire and optical ports round out pretty much every connection you could want back here, aside from eSATA. Or maybe an optional beer tap.

Going for a wander around the board brings us to the CPU socket first, which has plenty of space to install large coolers, and has an extremely neat line of solid capacitors and ferrite chokes, both of which give higher performance and lower energy consumption. In true GIGABYTE style the 8-pin and 24-pin power slots are placed at the top and right hand side of the board, the absolute best place for ensuring adequate space and access. This is particularly handy for cases with the PSU at the bottom, with the cables snaking up behind the mobo tray.

Continuing on our way, four DDR2 slots are placed neatly away from the graphics cards, allowing easy removal and installation in a case. Power regulation around these slots is very good, with solid capacitors again used to give a very reliable voltage. An IDE port is along the right hand side, as well as the front panel headers in the bottom corner. The SATA ports are inset by a few centimetres, allowing easy access, but some ports may be blocked with a long dual-slot graphics card in the lower PCIe slot. A low-lying heatsink is also present, but is not high enough to interfere with graphics cards (but is a very good Phillips-head screwdriver holder). Also located in this corner are two fan headers, one PWM, which is very handy for front intake fans. Firewire headers and a floppy port adorn the bottom edge of the board.

Around the expansion slots are the four USB headers, which are inconveniently placed just above the lower PCIe port, which will make cabling difficult. The clear CMOS header and battery are also here, which will probably require the removal of the graphics card to reach. Realtek audio is next to these slots, and the header is placed just above the topmost PCIe 1X slot, possibly causing cases with shorter cables not to reach. This location is extremely annoying, as the cable must either be slung across the expansion cards, or run underneath them at the left edge of the board. Strangely, GIGABYTE seems to have left a channel for just that purpose, devoid of any capacitors or headers to get in the way.

The board is absolutely covered in solid capacitors, with a traditional light blue PCB and brightly coloured slots and ports as far as the eye can see.

Our tour of the board complete, we got to chuck in our lovely Phenom X4 9950 and put this mobo through our array of testing. Performance was very good, with an impressive scaling shown in the multithreaded tasks. Naturally, a small level of overclocking was a breeze for this board, so we upped the ante and managed an FSB of 257, giving a speed of 3.341GHz. This is extremely fast, and stable enough to be run 24/7.

This board, as mentioned above, contains a Radeon HD3300. While this may not seem like the most exciting feature, in reality it is a bloody good addition. Unlike most integrated graphics that 'steal' a portion of the system memory, this has 128MB of DDR3 soldered directly onto the motherboard, which is exclusively available for the integrated graphics. With a 64-bit memory interface, the bandwidth is roughly twice that of having to access system memory, and is more than enough for all 2D tasks. The core runs at a stock of 700MHz. But what about 3D games?

Firing up Company of Heroes, using the same settings as the head-to-head tests, we managed an average of 6.4, a minimum of 1.5, and a maximum of 23.3 frames. While this isn't stellar, remember that you can still play with reduced detail settings, and changing to DX9 would increase performance significantly.

Another surprise was in store for us as we delved into the deep blue recesses of the BIOS. An option was set to auto, with a 700MHz speed. Naturally, that was changed to manual, and in true Atomic style, we *overclocked the integrated graphics by 200MHz!* This gave us a new average of 7.8, a minimum 1.7, and a max of 29. This speed bump netted a 21 per cent increase in performance, which would give exceptional performance in older games.

With exceptional overclocking performance, an integrated graphics core that outperforms some full-blown cards, and a great layout, this board is a definite winner.

Phenom X4 9950	200x10; DDR2-800 5-5-15-24	217x10; DDR2-866 5-5-15-24	230x10; DDR2-920 5-5-15-24
Super Pi 4M	2m 42.974s	2m 30.587s	2m 22.241s
wPrime 32M	55.879s	51.653s	48.469s
Hexus Pi Fast	47.24	43.82s	41.40s
CineBench R10 64-bit – single thread	2123	2285	2425
CineBench R10 64-bit – multi-thread	8334 (3.93x efficiency)	8967 (3.92x efficiency)	9421 (3.88x)
Everest Read	6568MB/s	7097MB/s	7491MB/s
Everest Write	5123MB/s	5543MB/s	5952MB/s
Everest Latency	68.6ns	63.4ns	60.3ns

NB: Due to beta drivers, 3DMark would not complete. This will be fixed in future updates

SCORE 9.0 OUT OF 10

Phenom X4 9950 Black Edition

AMD's hottest CPU, in more ways than one. Justin Robinson looks on.

PHENOM X4 9950 BLACK EDITION

I n issue 89 we had a look at the then top-end Phenom, the X4 9850. Today, we have the latest Phenom to test, a behemoth of a CPU with a multitude of features. But is it really worth considering?

The 9950 is made on the same 65nm process as the other Phenoms, and carries the same cache per core of 512kb. The stock speed of 2.6GHz (100MHz over the 9850), along with a system bus of 4000MHz, is quite underwhelming when compared to its predecessor. With a stock voltage of 1.3V, and a TDP of a blistering 140W, this CPU is sure to need aftermarket cooling to be overclocked, or to remain cool under even normal operation.

On the upside this Phenom has a special feature, in that the multiplier is completely unlocked. What this essentially means is that the CPU speed can be increased without having to increase the stresses on either the motherboard, or the memory. With a stock performance in all benchmarks higher than the 9850, overclocking pushes the envelope even further. For overclocking enthusiasts, there is nothing more useful than an unlocked multiplier, though extra cooling had to be installed to overclock this already warm processor.

Compared to the price of the 9850 when it launched some months ago, the 9950 is only an extra RRP$3 more, and comes with an unlocked multiplier, and a higher stock frequency. As an upgrade path, this is a very good choice for performance without having to change motherboards. Sadly, with the Q6600 that can be had for as little as $230, some wind is taken out of the 9950's sails.

All in all, the performance of the X4 9950 Black Edition speaks for itself, and for AMD enthusiasts, there really is nothing better than this.

Phenom X4 9950 Black Edition	200x13.0; DDR2-800 5-5-15-24	217x13; DDR2-866 5-5-15-24	230x13; DDR2-920 5-5-15-24
Super Pi 4M	2m 35.610s	2m 24.237s	2m 16.250s
wPrime 32M	54.522s	51.153s	48.062s
Hexus Pi Fast	43.63s	40.97s	38.39s
3DMark06	3599	3817	4044
CineBench R10 64-bit – single thread	2359	2468	2667
CineBench R10 64-bit – multi-thread	8479 (3.59x efficiency)	8810 (3.57x)	9607 (3.60x)
Everest Read	6842MB/s	7303MB/s	7806MB/s
Everest Write	5114MB/s	5627MB/s	5800MB/s
Everest Latency	62.7ns	58.8ns	54.5ns

SCORE 8.0 OUT OF 10

Phenom X4 9350e

Justin Robinson delves into AMD's latest.

PHENOM X4 9350E

A MD has been hard at work refining its manufacturing processes in an attempt to offer good performance for a competitive price. Its new offering, however, is a welcome entrant into the market, giving us the multitasking capability of a quad core, with the power consumption of a dual core.

Manufactured on the same 65nm process as the other Phenom CPUs, the 9350e has a TDP of only 65W, 30W less than their current CPUs. The 9350e runs at 2GHz, which is less than most other Phenom processors, but still more than sufficient for the majority of modern processing tasks. With 512kb of L2 cache per core, and the same B3 stepping that the rest of the family share (no more TLB error), this CPU is rated for a stock voltage of only 1.125V; this, amazingly, is further reduced at idle, with the core voltage dropping to only 1V!

The performance of the 9350e is very good too, and remains high even when overclocked. Due to the lower voltage, this CPU is more likely to achieve higher overclocks, though it is let down by the relatively small 10x multiplier. Overclocking this processor even by a small amount did provide large gains, however, and produced only minimal heat increases.

This processor would be a great choice for a home theater PC, or even for an office computer. The ability to leave it on for long periods of time, under load, without much heat generated is very welcome. In the niche market that this processor fits into, it is an amazing addition, with performance and low heat to boot.

Phenom X4 9350e	200x10; DDR2-800 5-5-15-24	217x10; DDR2-866 5-5-15-24	230x10; DDR2-920 5-5-15-24
Super Pi 4M	3m 12.406s	3m 2.193s	2m 52.942s
wPrime 32M	71.292s	66.706s	62.868s
Hexus Pi Fast	55.19s	51.64s	48.80s
3DMark06	2825	3031	3221
CineBench R10 64-bit – single thread	1774	1886	2021
CineBench R10 64-bit – multi-thread	6504 (3.67x efficiency)	6917 (3.67x)	7401 (3.66x)
Everest Read	6320MB/s	6729MB/s	7137MB/s
Everest Write	4781MB/s	4829MB/s	5178MB/s
Everest Latency	67.8ns	63.2ns	59.3ns

SCORE 7.5 OUT OF 10

Elitegroup 9600GT

Justin Robinson looks at one of the lesser-known players…

Elitegroup is not a big name in Australia, but in the good old USA the brand is popular with enthusiasts and ordinary users alike. However, with this particular card, you'd be forgiven for thinking that it was particularly big packaging for what, at first glance, looks just like a computer game! With a *Frontlines: Fuel of War* logo taking center stage, and the whole box adorned with gameplay images, it surely makes the card stand out of the crowd, especially on a display shelf.

Based on NVIDIA's g94 core, and carrying 512MB of GDDR3 memory on a 256-bit memory bus, the specifications are what you would expect from most mid-range cards. Core and memory clocks of 650 and 900 are stock, as is the PCIe 2.0 interface that we have come to accept is the de facto standard for the latest slew of cards.

Using a single-slot cooler, this is not the original full-length affair that the 9600GT cards were initially released with. Rather, this is a three-quarter-sized cooler, with a slightly larger fan, aimed at providing higher cooling potential at a lower noise level. Unfortunately, it doesn't improve temperatures at all over the reference, with 39 degrees at idle and 54 at load. The amount of noise it makes is higher too, with 57dBA idle, and 57.5dBA load.

The bundle includes all the usual DVI adapters, and Molex to PCIe, but also includes a DVI to HDMI adapter, and the necessary cable to use the sound from the onboard sound, through the HDMI output.

Frontlines: Fuel of War is, of course, included, and is a very welcome inclusion considering how relatively new the game is. Performance is decent across the board, but isn't amazing however.

Still, this card is an excellent choice for those wanting to get some *Frontlines* in, and get a graphics upgrade out of it at the same time. Elitegroup offers a full-featured bundle, and this card lives up to everything that it was intended to do.

Crysis			CoH			3DMark06	3DMark03
Avg	Min	Max	Avg	Min	Max		
38.405	21.96	46.505	45.2	3.8	62.1	10974	33217

SCORE 8.0 OUT OF 10

Foxconn 9600GT

Justin Robinson is blinded by the holographic packaging… but it is pretty.

Packaged in an extremely over-the-top box (complete with rainbow holographic effects that make actually reading the thing a chore), Foxconn presents its offering of NVIDIA's 9600GT in a manner that only affluent European kings are usually entitled to. Inspired by the glowing hyperbolic description that the packaging has just been given, the box was flung open, and the contents inside eagerly delved into.

Sadly, this is where the colourful descriptions end.

The 9600GT comes with 512MB of GDDR3 memory with a 256-bit memory interface. Core and memory clocks have been overclocked by five and ten respectively, but this amounts to an insignificant change when compared to even stock 9600GT cards. PCIe 2.0 is supported, but is not essential for this mid-range card.

Using the bog-standard NVIDIA reference design and cooler, the Foxconn idles at 39 degrees and 51.4dBA. This cooler is easily capable of handling the heat, keeping the card at 54 degrees and 53dBA load. Complete with a nondescript black and orange sticker, this card is neither attention-seeking, nor all that interesting to look at.

Included with the card are all the cables that you would require for use, such as DVI and molex power adapters, as well as drivers and a manual. There is no game included with this package, though. Also included is a copy of Driveclone 3 and VirtualDrive 11.5, both of which are a puzzling inclusion for a card aimed at the gaming market. They offer drive imaging, and image mounting; surely a game would have been a better choice for the intended user.

Performance results are decent, with average scores returned across the board. The small overclock has done almost nothing to add to the performance of the card. This card would be an okay choice for adding another card to a SLI rig, or as a cheap upgrade from an older 7 series card, but for the enthusiast or gamer, there are simply better offerings out there.

Crysis			CoH			3DMark06	3DMark03
Avg	Min	Max	Avg	Min	Max		
38.405	21.96	46.505	45.2	3.8	62.1	10974	33217

SCORE 5.5 OUT OF 10

Gigabyte 9800GT

Justin Robinson loves copper ever so much!

The 8800GT was a ripper of a card, providing excellent performance while being aimed solely at the midrange market. NVIDIA has now released a successor, but is it worth upgrading to?

Based on its new G92b core, this is a 55nm revision of the previous G92. This means that more cores can be made on a piece of silicon, hopefully lowering manufacturing costs and potentially lowering retail prices. With the same 112 stream processors as its predecessor, and the same 256-bit memory interface to boot, the only difference here is the 1GB of GDDR3 that GIGABYTE has included.

Like many other GIGABYTE offerings, this one comes with a Zalman VF830, which offers two heatpipes and a large central fan, but expands the card to a dual-slot size. This keeps the temps down to 39 at idle, and 44.8 at load, but the noise is quite loud at 67.4dBA load and 67dBA idle.

Performance in our tests was as expected, with a nice score returned in both 3DMark programs, and decent performance in the two games.

When GIGABYTE brought us the 9800GT, they accidentally brought a second one. With lightning-fast ninja reflexes, we grabbed the other card and slapped them both into our SLI rig. A decent performance increase can be had in all tests, with the most significant in 3DMark03, which is a much better test of multi-core solutions. Temperatures increase to 59 load and 44 idle for the hottest card, with noise at a steady 67dBA.

The 9800GT isn't an amazingly remarkable card, but for those who missed out on the 8800GT, or who are looking for an upgrade from a slower card, this is a great, albeit slightly noisy, choice.

	Crysis			CoH			3DMark06	3DMark03
	Avg	Min	Max	Avg	Min	Max		
9800GT	46.275	28.231	63.195	56.6	13.2	62.1	12515	36392
9800GT SLI	53.875	24.65	77.8775	59.1	40.7	61.7	15252	56835

SCORE 8.0 OUT OF 10

Gigabyte 9500GT

Another midrange card for Justin Robinson to play with.

Graphics cards. We're currently at a time in the market when there are half a million different product names, offered by a multitude of manufacturers, with a veritable mountain of differences even between two cards with the same core.

This latest card by GIGABYTE is based on the new G96 core, which is still manufactured in 65nm. With a depressing 32 stream processors, 256MB of GDDR2 memory on a 128-bit memory interface and a conservative core clock, this card does not appear to be a gaming monster, but then again it's also not offered as one.

Coloured with the traditional GIGABYTE blue PCB, and sporting a pimpin' black and gold single slot cooler (dotted with those solid capacitors that we love so very much), this cooler appears to be more than enough to deal with this cut-down offering. Temperatures were very good, with 47 at load and 39 at idle, but the noise generated was ridiculous, with 68dBA at idle, and 68.6dBA at load! For such a low heat output, this is completely unnecessary, and eliminates any possibility for using this card in a HTPC.

Performance, as expected, did not raise any bars. With only 5400 3DMarks06, and an average of only 25fps in CoH, this card isn't very appropriate for any kind of current gaming, but will perform averagely in every title. This card will shine in older games that do not require much grunt, however.

With a noisy cooler, and only decent performance, this card would be okay as a cheap card to use for HD movie playback and some minimal gaming, but hardcore gamers should look elsewhere.

Crysis			CoH			3DMark06	3DMark03
Avg	Min	Max	Avg	Min	Max		
18.925	12.56	22.39	25.0	4.3	55.2	5408	16247

SCORE 5.5 OUT OF 10

Razer Goliathus Speed Edition gaming mouse mat

Just how much engineering is really involved in a mouse mat? David Hollingworth finds out.

Razer is known for making some pretty good gaming peripherals, especially mice, so when the company releases a new gaming mat, it's probably worth looking at. That said… Mouse mats. Of all the various peripherals, guff and miscellanea, the humble mouse mat is probably the one thing that most people almost invariably think of as optional. At Atomic HQ, for instance, our mats consist of an eclectic mix: one gaming promo mat, a so-called ergonomic 'boob' mat (for David 'lothario' Field), a spare gaming mat for the designer, and the high-tech manila folder with many phone numbers scribbled on it that the editor uses.

And that's assuming you use something at all, and don't just mouse away on whatever surface actually makes up your desktop.

Razer certainly makes some pretty big claims about the Goliathus Speed Edition. It apparently features an advanced cloth weave, "engineered to exceed the exacting demands of the world's top professional gamers…" A big claim, as we said, and backed up by testimonials from some named gamers. When we unboxed the mat, though, it just seemed to be your standard cloth issue mat. Can it possibly be *that* good?

Hyperbole aside, the quick answer is… pretty much.

The mat features a rubber base that keeps it solidly in place in even the most intense gaming sessions. The top, too, is pretty well designed – a lovely tight cloth weave that, in conjunction with a modern mouse with hyper-slick feet, provides a lovely gliding motion – it certainly earns the Speed edition moniker. There's still enough resistance, too, so that you can more adequately judge movement and distance. A hard mat might deliver more precise movement, but isn't nearly as comfortable.

The Goliathus comes in three sizes, and we reviewed the middle option, which was still a roomy 254 x 355mm. There are also the Control editions of the mat, which have a looser more textured weave.

Thankfully this isn't an expensive bit of kit, so if you're in the market for a new mat, this is a great option for gamers. Is it enough to ditch a mat you're happy with, though? Well, at twenty bucks, it's certainly not an expensive experiment. We certainly played better using the Goliathus – you might too.

SCORE 8.0 OUT OF 10

Renegade Gaming Chair

David Hollingworth gets a butt massage and some gametime with the latest hot gaming accessory.

The Renegade gaming chair is to gamers what the Spinemelter 2000 is to Homer Simpson. To wit, it is the answer to all the world's problems, a paragon of comfort and indulgence. Surely, with a chair dedicated to producing gaming bliss all of one's ills must disappear… mustn't they?

Well, no, actually. If you smell funny and have no friends you'll still be in that state after buying this chair; but you will, at least, have a very cool chair.

The Renegade hooks up to your favourite console, providing both sound and vibration to deliriously wealthy gamers. There are speakers mounted in the headrest to deliver the aural action, lights around the bottom, and a 12-motor system to provide the physical feedback. There's a range of controls for volume, intensity and other feedback; a

good thing, as at full blast the chair could almost be considered a torture device.

Once you get the settings comfortable, though, the Renegade delivers quite a good experience. The rumble provides a nice amount of environmental feedback, while the speakers operate not unlike a set of headphones, though offering slightly more spatial sense and a bit more oomph. The lights, though, are the real kicker, as they flash in time with – for instance – grenade detonations. All of these effects combined can make firefights and frenetic action seem intensely real.

And since you're essentially paying nearly $700 for what might be the most indulgent peripheral ever, you get some neat extras. The Renegade features a pull-out drawer for storing games, a remote holder, and – most importantly – a drink holder. It even comes with a massage setting so you can relax and let go of all the tension a long CoD4 session can leave in its wake. Bliss.

All that said, the sound reproduction is not nearly as good as a dedicated 5.1 set-up, so it's up to you whether you want high fidelity or high immersion. Some might find the rumbling a little off-putting after a while, too.

Still, for the gamer who has everything, and still wants more, this is a fantastic – if expensive – toy.

SCORE 7.0 OUT OF 10

HSPC Top Deck Tech Station

Justin Robinson attempts to structure his testing escapades.

SPECS
Price **$120**
Supplier **PC Case Gear**
Website **www.pccasegear.com.au**
Specifications **Open-air benching station; two-level design; compatible with ATX, mATX, EATX; 12cm fan included; mobo headers (power, leds, reset) included**

A handful of important discoveries have influenced humanity throughout history. Fire, the wheel, electricity, splitting the atom. These now appear meaningless, eclipsed by something that looks amazing – on paper at least. Benchers and overclockers alike have toiled away on tabletops, kitchen counters and coffee tables, but HSPC aims to change that.

Resembling a multistory car park, the Tech Station is split into two levels. The bottom level includes a neoprene mat, onto which the DVD drive and PSU are placed. Hard disk drives are suspended by two acrylic rails (held on by a pathetic four screws), up to a maximum of two drives. Up on top is where the action is, with space for the mobo, expansion cards, and cooling.

Unfortunately, this is where the execution starts to warp. The Tech Station is flatpacked in a plain white stickered box, and an instruction book. Proclaiming a simple "20-30 minute assembly", we set about putting the station together, comforted by the message on the box "no sharp edges". Boy, did that box lie.

Assembly took a total of one hour and 32 minutes, three times the maximum amount described on the box. Sharp edges were more populous than oxygen atoms, causing small cuts on our hands, and the occasional exclamation of frustration. Holes that were supposedly pre-threaded took a herculean effort to screw anything into them (not to mention the dodgy plastic thumbscrews that 'secure' the expansion cards, and rather than screw in neatly, simply shred themselves into plastic strips).

When finally assembled, sure the thing looks good. But the ATX holes, which are a standard that every single case manufacturer can adhere to, do not line up at all; rather they appear to be placed within a 10mm radius of where they should be. The only way to actually secure a motherboard to the station is if you happen to have an EATX board, as no other standard has provision for it.

With a jaw-dropping price, hand-lacerating build quality, and overall uselessness, this product isn't worthy of any serious enthusiast's attention, and should be avoided like the plague.

SCORE 3.5 OUT OF 10

Microsoft Wireless Laser Desktop 7000

David Hollingworth is veritable Liberace of the computer keyboard. Wait, that sounds funny...

SPECS
Price **$129.95**
Supplier **Microsoft**
Website **www.microsoft.com.au**

When Microsoft got into the peripheral business many years ago, a lot of people scoffed. We scoffed, for instance, but we're happy to say we were wrong. The Redmond Giant has put out a lot of good hardware over the years, and some dogs of course, and the latest to grace our desk and where the proud brown stains of regular use in the office is the Laser Desktop 7000.

Actually, that last bit is kind of inaccurate, because the black rubber wrist-rest of the keyboard and the black plastic of the mouse are more or less impervious to stains. They're both also very comfortable, and the mouse in particular has a wonderful shape to it that really sits well in the palm of your hand. Those with smaller than average mitts may find it a touch difficult, but we found it a pleasure, at least ergonomically.

In usage, though, it's a slightly more bitter tale. The keyboard features a curved set of keys with slightly elongated center keys; it takes a little while to get used to, and even after a couple of weeks of use, we were still making a lot more mis-keys than normal. The keys have a rubbery feel to them, and an average amount of travel. It's not an ideal gaming board, for instance, because of that slight key displacement. There's also the usual plethora of extra keys for media functions and extra browsing options.

The mouse, too, is not as precise as it could be. Many years of scoring headshots on de_dust has left us with a precise mouse hand, but mis-clicks abounded. This is due, in part, because of the off-set position of the laser; it sits closer to the thumb than the normal centered position, and so precise mousing and clicking can be a little challenging. The scroll wheel is clickless, which offers good operation within the GUI if Windows or other apps, but is again not ideal for gaming.

It's an attractive set, at least, designed both visually and technically with Windows Vista in mind. The clear edge is meant to mirror the looks of Aero, while the mouse features a one-touch button that lets you take advantage of Vista's shiny Flip function. The Laser Desktop 7000 may not be the enthusiast choice, but it's an attractive, feature-rich option nonetheless.
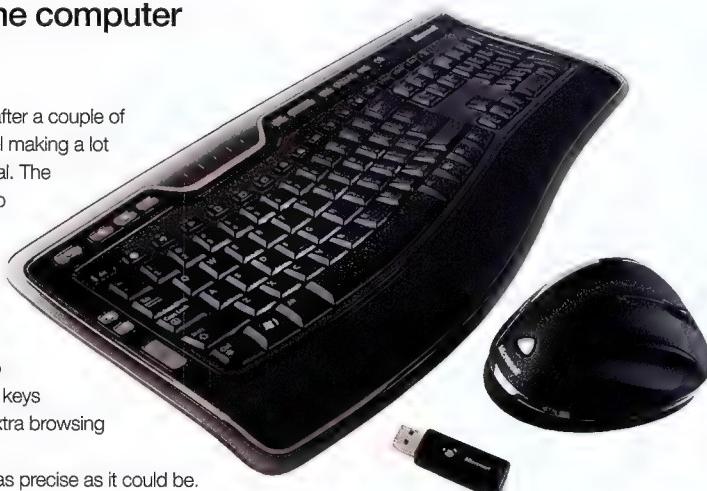
SCORE 7.0 OUT OF 10

Creative SoundBlaster X-Fi Titanium

**Jake Carroll** knows a lot about soundcards, and he knows what he hates. He doesn't hate this...

SPECS

Price
TBC
Supplier
Creative
Website
http://au.creative.com/

With the approval of Johnathan 'Fatal1ty' Wendel, the Creative SoundBlaster X-Fi Titanium is the new hardcore card Creative hope will capture the hearts (and ears) of gamers everywhere. This month, we put the new PCI-E form factor to the test.

Our test system for the X-Fi Titanium consisted of an Intel quad core solution running Windows Vista Ultimate Edition Service Pack 1 (x64).

In issue 91, Creative presented to us a card with Crystalizer technology embedded. As we have discussed in other articles, the technology can't fix or improve compressed audio, rather it seems to statically add bass, mid and high response to existing signal. We established through testing and measurement that the Crystalizer adds total harmonic distortion (THD) and noise to the signal unfortunately.
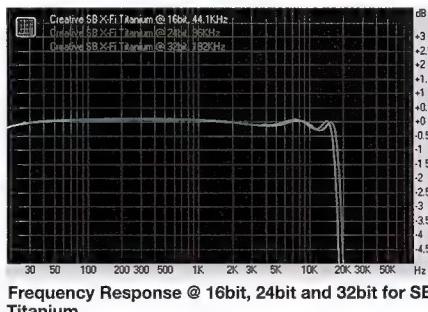

Frequency Response @ 16bit, 24bit and 32bit for SB Titanium

Listening to the Creative SB X-Fi Titanium with no enhancement yielded us a bright, dynamic sound, with perhaps a little unwelcome extra bass-response (albeit popular in much of today's audio and audio/visual entertainment).

We need hard numbers to quantify hardware performance, though. We utilised RightMark's Audio Analyzer engine to run loopback analysis on the input/output of the card. We used Frequency Response, Noise and THD to determine the quality of the DACs, OP-Amps and internal components.

The analysis showed smooth and consistent responses. With a frequency response at 192KHz of [+0.08, -0.31] measured from 40Hz to 15KHz this card has come in extremely close behind the mighty Auzentech X-Fi Prelude [+0.11, -0.10]. Finally, some real contest for the Auzen in the frequency response stakes!

Noise is consistent across sample rates, which is a refreshing change for the Soundblaster line of cards. With a noise average of 92.9 dbA for the 32-bit sample, it has come closer than any card has
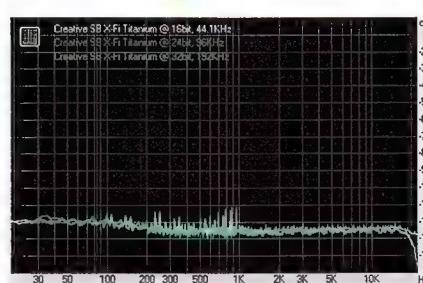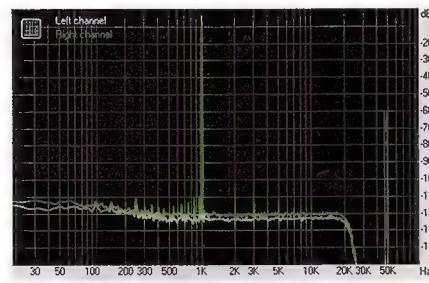

Noise @ 16bit, 24bit and 32bit for SB Titanium

ever come to the Auzentech X-Fi Prelude (96.4 dbA).

THD was probed at 0.0019 per cent of signal composition at 192KHz. The second best THD result we've seen, it is, once again, only eclipsed by the Auzentech X-Fi (0.0011 per cent).

We are left with the impression that Creative has put some additional thought into this iteration of its X-Fi. Creative has attempted to make it very clear to the world that this card isn't a traditional PCI to PCI-

THD @ 16bit, 24bit and 32bit for SB Titanium

E bridge device, rather, it is a PCI-E native device. Whether this has any effect upon performance or interconnection efficiency is unclear.

As the first and only card to have come so close to the Auzen behemoth, we give kudos to Creative where it is due in the audio quality proper stakes. As far as EAX Advanced HD 5.0 processing is concerned, we can offer up that the card had no problems with positional audio in Assassin's Creed (1.02 patch). Given the problematic nature of this title with many different hardware configurations, for it to work out-of-the-box is a good indicator that Creative has gotten the Alchemy + X-Fi API right with this card.

Creative has mimicked ASUS and shielded the card with a metal/plastic PCB plate. While it looks extremely cool and probably has some practical benefits, it does generate additional heat across the X-Fi SPU. Installation of the card caused several BSODs, with the Creative installer, dll and hardware detection engine still being quite messy. We also experienced a fairly serious OS level corruption problem when trying to run the X-Fi Titanium in the same host system as an Auzentech X-Fi.

The X-Fi Titanium is Creative's best effort to date. It has taken on the performance ruler of the market and come out remarkably close. With guaranteed Advanced EAX 5.0 HD functionality, a great software package and a clean PCI-E form factor, this is a card seriously worth considering for the serious gamer, or the occasional THX/movie junkie. Is it an Audiophile card or high-end card, though? Probably not, but it certainly tries!

SCORE

8.5 OUT OF 10

Lian Li Armoursuit PC-P80

At long last, David Hollingworth gets some armour.

We're coming to this behemoth of a case from Lian Li a touch late, but given the current resurgence of ATI, it's probably a better time to look at it now than ever before. And what does a Lian Li case have to do with ATI, you ask? Well, this special edition case is actually cross-branded with ATI's Spider platform logo, so it's certainly not one for the NVIDIA fanbois out there!

It's a also an absolute monster of a case, enormous in practically every dimension and coloured an imposing red that simply screams "I AM VERY SERIOUS ABOUT MY COMPUTING! YAH!" And the Spider branding, though some will say it's over the top (and the Atomic team may agree), is at least very well executed. We really hate seeing windows on PC cases that are made of cheap plastic. The spider-shaped window on the PC-P80 is proper old school Perspex, and the spider outline is on the inner surface, safe from damage.

The rest of the case is similarly up to Lian Li's usual level of design elegance, and like last month's Tyr case, even the interior is fully coloured. Hell, even the external thumb screws are colour-matched!

Inside it's the usual Lian Li story of well-machined aluminium and thoughtful design touches, but closer inspection suggests that something may be off… for one thing, the general finishing of the edges is a little rough, and the 5.5in drive enclosure mechanism seems a little on the cheap side. Trust us, the last thing you want from a case that costs nearly a thousand dollars if even one component that feels a little nasty. The 3.5in HD bays, at least, feature a novel little anti-vibration solution involving little rubber slugs that slot into the bays themselves. Kind of low tech, but very effective.

The case is designed from the get-go with enthusiast-grade usage in mind, but again, there are some problems. Sure, there's room enough and then some for a water-cooling rig, plus two pairs of outlet grommets, but those grommets are really nasty hard plastic.

On the up side, though – and there is more good than bad about this case, to be sure – it's as roomy as hell. This is a case that, thanks to a removable mobo backplate, facilitates easy upgrading, excellent cable management and great airflow thanks to a mess of 140mm fans. They are a touch on the noisy side, though, and with no sound-dampening in the case, it is a slight issue. The three front fans are also curiously mounted in the case door, so opening the door during operation will of course drastically hinder ventilation. The door itself, however, is solid, and can be swapped to open from either the left or the right.

There's no doubting that this is a good case, but it's not quite up to the usual Lian Li standard. Similarly, the styling of the case will certainly not appeal to those on the NVIDIA side of the fence. And, lastly, there's the cost… it's simply a difficult case to recommend to all but the most ardent of fans.
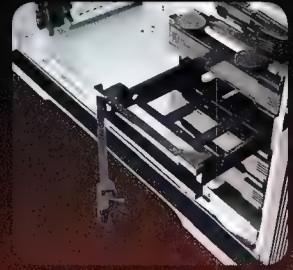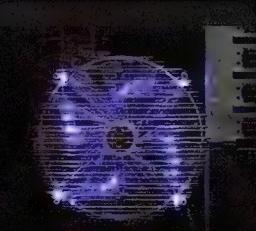
SCORE **7.0** OUT OF **10**

Scorpion Stinger Overclocked

Want a fast, slick gaming PC? David Hollingworth thinks this fits the bill on all counts.

If there's one thing we like more than a cleverly specced and well put together PC, it's a cleverly specced and well put together overclocked PC. Scorpion Computers has just put together a new range of machines that start at a humble $2275 for a complete setup, and they're a pretty neat bunch. We thought long and hard about what end of the range we wanted to look at, but we're size queens here when you get down to it – we had to look at the top of the range Stinger OC.

Scorpion has erred on the side of completeness with the entire new range, including not only keyboard and mouse, but monitor, speakers and even mouse matt! The most impressive of all that kit is the 24in widescreen Samsung; we are unabashed fans of Samsung's LCDs, in both its monitors and televisions, and this model is no exception. With everything else, it's just a remarkably complete bundle, full of solid, brand-name reliability.

But, it's what's in and around the box that really counts, so let's take a look at that.

Coolermaster is very much flavor of the month with box-builders this issue, though Scorpion has been happy to leave the CM badge in place. THe Stacker 830SE is a solidly built case, with excellent ventilation, though with a surprisingly small amount of fans. There's one 120mm at the front, another

strapped to the Ultra-120 heatsink, and then one more at the case's rear plate. Given the impressive overclock, we would have expected more, but the truth is the case temp never gets anything like as impressive – or scary – as that in the Pioneer system reviewed this month.

That would come down to the choice of graphics card, we think. Instead of reds under your bed, Scorpion's gone green, choosing two GTX 260s in SLI. These run quiet and cool, and though they don't perform quite as well as the equivalent ATI cards, when twinned with a smokin' CPU they more than deliver the sauce.

Scorpion has wrung another 600MHz or so out of the Q9550 in the Stinger, boosting the machine to a stable 3.4Mhz all up. We saw in last month's gaming PC roundup that the CPU is now becoming the major performance bottleneck for a gaming system, so anything that can squeeze a few more cycles out of the current crop of chips is to be appreciated.

In this case the results a very good for the price point. The Stinger managed a score of 18,628 in 3DMark06 71,929 in 3DMark03. This is not on a par with a souped up ATI system – like Pioneer's on page 59 – but still blazing performance for all but

the most graphically punishing of games. In fact, in our Crysis testing the Stinger delivered a blistering 37.99 frames per second. Not at all to sneezed at.

As a complete bundle it's a pretty good package, but there are a few issues. Our usual complaint of a lot of high end systems – too much RAM than the OS can address – is thankfully not a problem this time around, and the RAM that is present is tasty DDR3 in flavour. However, the system's cabling is a little at fault. The majority of leads, wires and cables are neatly bundled up with cable ties, but one fan power lead was simply knotted up to try and keep it out of the way of anything important. Unfortunately that was not enough, and when we first turned the system on we were aghast at the buzzing, almost tearing noise coming from the case. This cable had managed to wedge itself in the rear fan; a few more seconds and it likely would have severed itself completely.

It was a problem easily fixed, but it sadly detracts from what is otherwise a superlative performance PC from Scorpion. Given that Pioneer had similar problems, we can only recommend that whenever you get a pre-built PC, open it up. Do not even plug it in until you've gone over the cabling and made sure that the first time you power it on won't be your last.

SCORE 8.0 OUT OF 10

DELL XPS730

Dell XPS 730

Dell's premium gaming brand is still big bright and shiny, but does its latest machine actually perform?

Reviewing a Dell machine is always an odd prospect. It's not that they're hard to review, but criticising something from Dell always seems like too easy a proposition for one thing (let's face it, even they know they are not the top of the performance heap), and for another each configuration of machine they send us is simply just one of many ways that a buyer might configure it.

The XPS 730 we looked at in our labs was a modestly specced system with a pair of workman-like 8800GTs in SLI, for instance, but that can easily be switched out in favour of a couple of 1GB Radeons. Some PC vendors offer carefully crafted, gourmet-grade machines. Dell is more of your generic, but infinitely configurable pizza joint. Mmm… pizza…

And like any pizza –we've never met one we don't like – there's a lot to like about this machine, though there are the usual tell-tale issues that stop the XPS from truly reaching the kind of must-have status for your average PC enthusiast.

On the like side of the equation, it's a pretty good overall bundle, with a 24in monitor of Dell's usual high quality, the aforementioned 8800s (which is still a good card, even though it's now looking rather old) and a quirky case with a lot of nice touches, like backplate lighting, a mess of 120mm fans and the usual thick aluminium construction. There's even a

Fatality series sound card from Creative, so anyone with a good sound system will be pleased. With a mess of USB ports in front and back, plus e-SATA in the rear, it's an eminently connectable machine, too. The 730 also features a Blu ray drive, which combined with the soundcard and large monitor makes this quite the entertainment system.

Internal cabling isn't up to the usual Dell standard, though, but there are some thoughtful touches to offset the rat's nest. Another three HDD cables are already run into the drive bays, so adding more drives will be a cinch in the future.

It's a good thing the case is well ventilated and doesn't lack in fans, though, because the Dell engineers have chosen a rather poor placement for the soundcard. It sits on the slot directly above the top 8800, within a half centimeter in fact, and nearly completely obscures the fan intake for the cards cooler. If you've ever been in doubt about the importance of clear airflow, trust us when we say it matters; this upper card was considerably hotter than its more fortunate brethren.

And, of course, Dell has featured our usual bugbear of more RAM than the 32-bit version of Vista can address. The 730 features 4GB of lackluster Elpida DDR3; that's a total of 5GB when

you include the two VGA cards, so that's 2GB too much. To illustrate, we ran our benchmarks with both the full RAM count and with two 1GB sticks removed. Results were identical.

But at least those results were pretty solid. In 3Dmark06 the XPS 730 ran in a solid 55,625, which is not bad given the cards installed. Crysis testing was similarly respectable, hitting an average fps of 18.59 with all settings maxed at 1280 x 1024 resolution. But if you've a nagging feeling there's something rotten in Dellmark…

You're getting some good gear in the 730, but when you look at the specs of some of the machines in last month's gaming PC roundup, especially the NRG Tornado, the 730 suddenly seems like a more expensive proposition for less performance. Sure, Dell offers excellent support and back-up, and will even pick up and recycle your old machine (which, let's be honest, is a great service in this day and age), but is it worth the extra cost to you?

Dell always split opinions in the Atomic HQ. The company is at least making efforts in the enthusiast gaming space, but try as hard as it might its machines never quite seem properly specced. Similarly, the proprietary case design is sleek to some, and teeth-gratingly bad to others. Essentially, the real value in a Dell is in the superior product support. If you like the idea of onsite replacement and installation of faulty parts, then it's doubtless the right choice for you. But if you're at all capable of your own tech support, there are better performing and cheaper options on the market.

SCORE 7.0 OUT OF 10

Pioneer Dreamvision

David Hollingworth is impressed by this machine, and saddened that it's let down by a handful of poor build choices.

SPECS

Price **$5899**
Supplier **Pioneer Computers**
Website **www.pioneercomputers. com.au**
Specifications **Intel Core 2 Quad Extreme QX9650; X48 Extreme Chip set LGA775 Mother Board; 8GB (4 x 2GB) DDR2 RAM; 2x ATI HD4870 512MB Graphic card; Integrated 7.1 Channel High Definition Audio; 2x 300GB 10,000 RPM Serial-ATA Hard Drive; 1000GB 7,200RPM Serial-ATA Hard Drive; 25G 4x Blu-Ray, 12x DVD and CD Writer and Player; Integrated 10/100/1000M Ethernet LAN; Razer Copperhead Tempest Blue mouse; Razer Tarantula gaming keyboard; Deluxe Midi Tower ATX Case 690; Microsoft Windows Vista Ultimate 64-bit.**

We've had some issues with Pioneer systems before. For true enthusiast-grade quality, the company's builders have simply not quite been on par. Then we saw Pioneer's latest Dreamvision PC, and it's test results, and we have become a little excited.
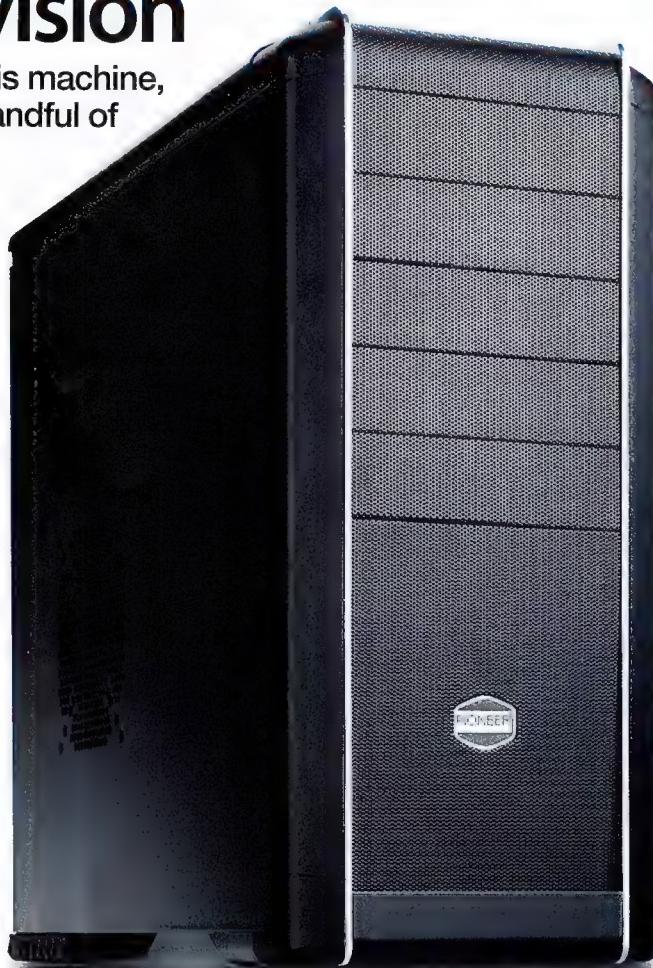
That's not to say that the machine is without its flaws – and some serious ones at that – but it's a well-specced, very up to date PC that fairly laughed, villain-like, at every test we threw at it.

The Dreamvision is housed in a neat and tidy Coolermaster case with the badge chipped off, and a couple of aftermarket Pioneer and NVIDIA badges stuck on the lower fascia. Pioneer's also taken the opportunity to up the fan count and bling factor by a high degree. There's enough fans in the case to technically class it as a hovercraft of some kind – the front fascia features a 120mm fan with blue LED, and there are two more in the main side-panel. They look particularly good behind the black mesh of the Coolermaster.

There's a plainer 120mm fan at the rear of the case, and the top of the case houses two 140mm fans. It's a pretty good amount of ventilation, one that impresses even us. It's handy, too, because Pioneer has opted for a stock Intel cooler on the tasty tasty QX9650 CPU. Why you would go for such a great processor and trust it to a noisy low-end Intel fan is beyond us, but the extra case fans obviate that problem somewhat.

The mess of cooling is doubly handy considering the graphics card load out – two 4870s running in Crossfire. We've already discovered just how hot these cards run in our Head2Head this month, and the Dreamvision is no different. With this many fans, though, the cards are held in check and you can even touch the 4870s without getting a nasty burn. Impressive.

We've already worked out, too, that ATI has done some fine work and stolen a march from NVIDIA in the latest round of fighting. In the Dreamvision, this performance translates into some wonderfully big numbers in our testing. In 3DMark06 our boy scored 22,028, fairly rampaging over the top of every machine in last month's roundup. In Crysis the average fps was even more impressive – 34.07 with all settings maxed out and with 4x AA. Upping the test to 8x barely caused a stumble, and the Dreamvision romped in with 31.9fps.

So, yes, it's fast, faster even than NRG's top dog. But whereas the money you plop down for the NRG system nets you a complete setup, monitor and all, the Dreamvision is only accompanied by a Razer keyboard and mouse. As we've said before, a lot of people have spare monitors, so it's not a big problem.

The big problem, we think, is the 8GB of RAM.

Pioneer has at least chosen a 64-bit version of Vista, so that can be addressed, but it's still a huge number. As with the Dell XPS 730, we were curious to compare performance with less memory, so stripped out three sticks, leaving 2GB plus the memory on the graphics cards. 3DMark06 delivered very similar results, though both 3DMark03 and Crysis performed with less alacrity. Crysis was the most drastic drop, with average FPS coming in at 21 at 8x AA. What that tells us is that with most games and applications, that much RAM is overkill. Only the most intensive games – or with apps like video editing – will that much RAM actually be handy. Still, DDR2 chips are getting cheaper all the time, so would the $200-odd saving make a difference? Only your wallet can judge.

Case build is of a remarkably high quality, though there was one stray fan cable that we had to rescue from a fan before it went all chop-chop-argh-I-can't-feel-my-legs on us. Given it was the CPU fan, that's something that no one wants to see. Otherwise, everything is obsessively cable-tied and bundled out of the way, which is exactly the way we roll here at Atomic. This neat bundling makes the airflow from the many fans even more effective, and means that on power-up there's nothing to obscure all those glorious LEDs from shining through. It's really quite a site.

You get a lot of bang for your buck with this machine – it's quite possibly the best pre-built box we've looked at yet, at least in the performance stakes. The price is not ideal, true, but you do get a lot of good kit, including a Blu ray drive. Some niggles do hold it back though, but nothing can detract from what is otherwise a very solid PC from Pioneer.

SCORE 8.0 OUT OF 10

GROUNDZERO

GPGPU and the Law of New Features

Daniel Rutter gets a nasty case of feature-creep.

It Is Written that when a new, much-ballyhooed feature shows up in cutting edge expensive graphics cards, you shouldn't expect that feature to actually amount to anything for a few years.

This Law of New Features applies to everything.

Remember hardware transform and lighting? How about full-scene anti-aliasing, and anisotropic filtering? Every feature is introduced with great fanfare and gold-embossed text on the box, but it's not actually useful for years. That's partly because it's not a good business plan to write software for hardware that not many people yet own, but it's also because the early versions of new features are often underpowered and incomplete.

Which brings us to GPGPU.

GPGPU stands, rather untidily, for 'General Purpose computing on Graphics Processing Units'. It's using graphics card hardware to do things other than fling pixels at the screen, and it's something that people have been talking about since... heck, probably last century.

Back then, graphics processors were too specialised to be useful for much besides graphics. They didn't, for instance, have the ability to quickly process numbers with enough precision. In brief, an old graphics card that could only do 16-bit colour could only quickly process 16-bit numbers, and that isn't enough precision for many interesting applications.

Early on, people were also trying to shoehorn GPGPU tasks into the graphics Application Programming Interfaces (APIs), because that was all that was available. There was no other way to tell a graphics card to do anything, unless you hit the hardware directly and wrote new versions of your software for every possible card.

Both NVIDIA and ATI now have pretty thorough GPU programming toolkits available, though. So GPGPU coders no longer have to trick the graphics hardware into doing non-graphics tasks by sending it peculiar graphics instructions.

Modern video cards are actually specialised parallel computers, which just happen to usually run graphics software. Give them different software, and they can perform different tasks, sometimes much faster than any CPU. They're only

> ## GPGPU coders no longer have to trick the hardware into doing non-graphics tasks...

any use for highly 'parallisable' tasks – jobs that can be broken up into many independent streams, where the input for one stream doesn't depend on the output from another – but there are quite a lot of jobs that can be broken up that way.

The most obvious such task for the modern nerd is distributed computing, like SETI@Home or Folding@Home, where zillions of PCs each work on their own little piece of one gigantic job. There's been a Folding client for ATI graphics cards for some time now, and a beta client for NVIDIA cards came out a few days after the release of the new 200-series cards.

And, as I write this, NVIDIA has just announced that they'll be adding support for PhysX physics acceleration to the drivers for various of their recent graphics cards, and making the standard open for other manufacturers too.

Havok FX, a GPU-accelerated version of the popular Havok physics engine, has existed for a couple of years now. But, following the Law of New Features, it's been used by almost nobody. Perhaps that means it's time for GPU PhysX to take over the market.

Windows Vista has a part in this drama too. As compensation for its slower graphics, Vista turns the video adapter into a virtual device, like other parts of the PC, with multithreaded tasks and virtual memory and several other impressive buzzwords.

(James Wang's piece from the October 2006 Atomic has more on this: **tinyurl.com/68sfkv**.)

Intel's upcoming Larrabee GPU promises to be the first Intel video adapter that actually deserves the Extreme Ultimate Super Mega Graphics names that Intel will doubtless give it. Larrabee will be based on a bunch of Atom cores – essentially, a horde of largely standard x86 CPUs, not weird specialised graphics processors.

Perhaps that's what it'll take for GPGPU apps to push their way past the Law of New Features.

Dan Rutter is feature-rich.
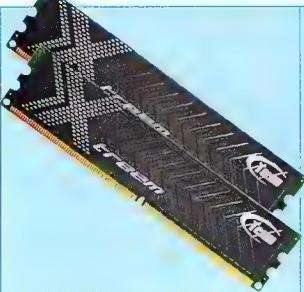**dan@atomicmpc.com.au**

ATOMIC KITLOG

Our choice for the best gear the land has to offer

There's nothing sexier than new kit. And whether you need to horde your pennies (Budget), want the most power for your dollar (Performance) or own a small mansion and a collection of sports cars (Extreme), we're here to help with this handy matrix of *Atomic* recommended products. You may find your needs fall between categories – that's okay, just mix and match to suit your budget! Each piece of kit has been reviewed hands-on in *Atomic*, so if you want to learn more, look up the issue and page number listed.

	CPUs	Motherboards	Memory	Video cards
BUDGET *I can't afford to eat... gimme gear!* **intel**	**Intel Core 2 Duo** PRICE $100-$480 — Stretch a little further and buy yourself a Core 2 Duo – you'll be thanking yourself later. The E4400 is the cheap ticket to speed, at $165.	**GIGABYTE GA-G33M-DS2R** PRICE: $132 — Using the G33 northbridge and has overclocking performance like its full ATX brethren, this Micro-ATX offering is extraordinarily hard to pass up. *Reviewed in Issue 81 – Page 52*	**TEAM Xtreem Dark PC2-6400 C4** PRICE $80 — Cheap, overclockable and good lookin' to boot. The modules fill the void that was previously left between cheap value RAM and enthusiast overclocking kits.	
BUDGET **AMD**	**AMD Athlon 64 AM2 X2** PRICE $135-335 — Cheap CPUs are a wonderful thing, and the X2s are now wonderfully cheap. The 3600+ is your budget baby at about $85.	**GIGABYTE AM780GM** PRICE $100 — This mobo had Josh drooling and dreaming of the ultimate budget media center - not a state he often finds himself in! *Reviewed in Issue 89 – Page 40*	*Reviewed in Issue 80 – Page 56*	**GeForce 9600GT 512mb** PRICE $150 — It's simple, it's black, and pumps out some pretty pleasing pixels for a very reasonable asking price. So far, easily the best of the 9-series. *Reviewed in Issue 87 – Page 43*
PERFORMANCE *Hardware that bangs the best for buck.* **intel**	**Intel Core 2 Quad** PRICE $300-680 — Core 2 Quad – a processing powerhouse, now affordable and overclockable like buggery. The Q6600 is the best buy, at about $240.	**Foxconn P35 Mars** PRICE $236 — A great board for the enthusiast with a mess of great ideas and good overclocking potential. *Reviewed in Issue 85 – Page 48*	**TEAM Xtreem Dark PC2-6400 C4** PRICE $80 — Cheap, overclockable and good lookin' to boot. The modules fill the void that was previously left between cheap value RAM and enthusiast overclocking kits.	**[NEW ENTRY]**
PERFORMANCE **AMD**	**AMD Athlon 64 AM2 X2** PRICE $135-335 — The X2 series are still fantastic chips, and in the face of the Intel threat are now going for cheap. The 6400+ is your current sweet spot at about $190.	**ASUS M3A32-MVP Deluxe** PRICE $242 — True perfection in mobo form. Very well laid out and overclockable to boot. *Reviewed in Issue 85 – Page 51*	*Reviewed in Issue 80 – Page 56*	**Sapphire HD4870** PRICE $325 — The 4870 outperforms the GTX280, and introduces a price that can't be beat. Can be used as a room heater. *Reviewed in Issue 92 – Page 36*
EXTREME *Gimme power. Money is no object.* **intel**	**Intel Core 2 Extreme QX9770** PRICE $TBC — The cream of the overclocking crop, based on the new Yorkfield architecture. Truly, Lord of the CPUs. *Reviewed in Issue 86 – Page 48*	**XFX 790i Ultra SLI** PRICE $555 — It's an imposing board that offers a host of enthusiast options, performance tweaks. We like. *Reviewed in Issue 88 – Page 40*	**Corsair DHX NV Kit** PRICE $900 — All up one of the most powerful and versatile kits we've seen. *Reviewed in Issue 90 – Page 50*	**XFX 9800GX2** PRICE $620x2 *Reviewed in Issue 88 – Page 50*
EXTREME **AMD**	**AMD Phenom X4 9850** PRICE $320 — Sadly gets beaten by a mid range Core 2 Duo, but still the top of AMD's pile. *Reviewed in Issue 89 – Page 44*	**ASUS Crosshair 2** PRICE $TBC — Quite simply the new and leading kid on the block when it comes to AMD boards. *Reviewed in Issue 89 – Page 42*	**Corsair Dominator Twin2X 10,000** PRICE $1016 — Crazy speed sticks that will also happily do 1T/800MHz/3-3-3-3. Comes with a fan attachment to keep things cool! *Reviewed in Issue 77 – Page 58*	**XFX 9800GX2** PRICE $620x2 *Reviewed in Issue 88 – Page 50*

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Noctua NH-U9B
PRICE $72

Labs tested to be the top of the cooling game without breaking the bank (or making you sweat – haha)

Reviewed in *Issue 89 – Page 36*

Samsung 200GB
PRICE $70

Super quiet and yet still fast, the 200GB Samsung offers excellent value for money.

Reviewed in *Issue 69 – Page 40*

Samsung 931C
PRICE $323

2ms of raging colour gamuts and beautifully smooth tonality that will make you weep with joy and hug strangers.

Reviewed in *Issue 70 – Page 56*

Steelsound 5Hv2
PRICE $120

Awesome gaming audio performance on a shoestring budget. Phenomenal 'phones.

Reviewed in *Issue 73 – Page 43*

Lian Li PC-7S
PRICE $125

Quality, elegance, refinement and style. The trademarks of a Lian Li case, now available at an entry-level price.

Reviewed in *Issue 79 – Page 46*

Thermalright Ultra 120 Extreme
PRICE $75

Tower cooling that will keep your tower cool. Whack a Nexus 120mm fan on for near silent cooling.

Reviewed in *Issue 89 – Page 33*

Thermalright Ultra 120 Extreme
PRICE $85

Make sure you get the optional AM2 bracket (hence the higher price). Grab that same Nexus fan.

Reviewed in *Issue 89 – Page 33*

Seagate Barracuda 7200.77 1TB
PRICE $300

Seagate's fancy new technology makes this beast both fat and fast. Mmm, toasty.
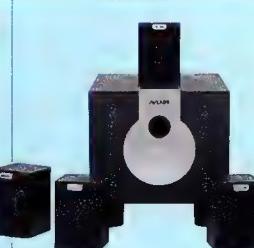
Reviewed in *Issue 69 – Page 40*

Samsung 244T
PRICE $999

Brilliance at 24", the 244T offers 6ms gaming, a wonderful gamut and more inputs than an alien hooker.

Reviewed in *Issue 69 – Page 48*

AVLabs AVL325
PRICE $165

While it can't hold a candle to the Z-5500D, with a price this low there's no excuse not to jump to 5.1.

Reviewed in *Issue 64 – Page 50*

Cooler Master Stacker 830
PRICE $285

Like the Stacker before it, this sensational Stacker stacks sumptuous specifications salaciously.

Reviewed in *Issue 61 – Page 36*

Asetek Vapochill Lightspeed
PRICE $1020

Vapour phase change. Ooooh. Vapour. Phase. Change. No matter how many times you say it, it's still cool (pun!)

Reviewed in *Issue 64 – Page 38*

Coolermaster Aquagate Max
PRICE $199

The ultimate in out-of-the-box water cooling solutions. For serious seriousness.

Reviewed in *Issue 90 – Page 36*

WD 3000GLFS VelociRaptor
PRICE $399x2

Dear lord. The performance king hath cometh, short of whacking in a SCSI. Buy two and RAID 'em.

Reviewed in *Issue 90 – Page 52*

Dell 3008 WFP
PRICE $2299

It's enough to make a grown man weep and beg. Or, at least, that's what we'd do for one of these simply gorgeous displays.

Reviewed in *Issue 88 – Page 59*

Logitech Z-5500D
PRICE $363

Able to play the 'liquid gold' that is DTS 96KHz/24-bit, this 5.1 beast can wreck both home and hearing alike with equal impunity.

Reviewed in *Issue 48 – Page 56*

Silverstone TJ07
PRICE $348

The Silverstone Temjin TJ07 is a huge hulking beast that shows you mean business in the finest style. Impeccable finish and plenty of room means win.

Reviewed in *Issue 65 – Page 49*

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GAMEPLAY

## GAMES, GAMING AND GAMERS COVERED ATOMIC-STYLE

What a month of turmoil it has been for gaming in Australia. We were, up until recently, very proud to be bringing you an exclusive hands on preview of Fallout 3, but now it appears that all we can do is tell you all about a great game that you may not be able to play, thanks to Australia's favourite State Attorney General. From our experience, we think the game's worth celebrating anyway, so in the hope that wiser minds will prevail, we've gone with the write-up regardless.

On top of that Logan takes up a very unique gaming challenge, and in turn throws down the gauntlet to all and sundry. We get a sneak peak at cyber-viking epic, Too Human, and steal a mess of gold from some nasty mercenary types in the latest entry in the Battlefield franchise from EA. And more besides. Game on!
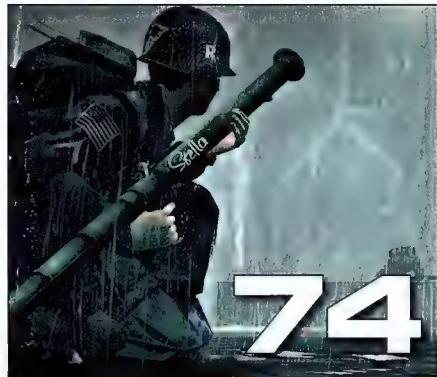
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Quick and the dead

What's it like to code a survival horror simulator in seven days? **Logan Booker** lived to tell the tale.

et's face facts - you're not going to make the next World of Warcraft or Gears of War by yourself. The time, effort and cash involved in producing, testing and marketing these games would overwhelm – and likely kill – the solo developer. Fortunately, the solution is simple – you have to think small. You have to be practical. You have to set yourself a deadline, and stick to it. If you have trouble managing a tiny project by yourself, then you don't stand a chance with a massive one that involves 60 or 100 people.

All this talk (or reading) is fine, but a demonstration is probably best. So, read on to find out how one man coded a compelling strategy game – complete with zombies busting into buildings and being blasted with shotguns – in a mere seven days.

The idea

A week doesn't provide a lot of time to write a design document. In fact, you can't do much pre-production at all. You need to take the core idea – the hook – and expand on it, so that every part of the game explodes with this fun and entertaining concept. Hopefully this explosion won't result in a blue screen or reboot.
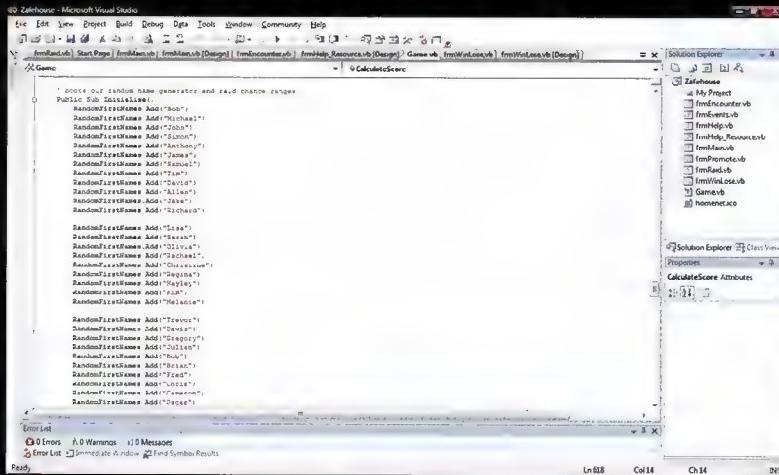
The title 'Zafehouse' was the first, and only, name used for the entire development process. It's a play on 'zombie' and 'safe house'. The reason for the house reference was because the game was originally set in a single building, but this quickly evolved into the six-building, town environment seen in the final game. These buildings include a hospital, mansion, house, warehouse, store and factory. Each one, except for the house, provides the player with a tactical advantage.

Okay, so no design document. But how about a design *paragraph*. Here's what we came up with:

"Zafehouse is a turn-based zombie survival horror simulator, where the player must keep as many survivors alive as possible for set period of time. During each turn, the player must assign survivors to buildings or send them on raids to gather food, medicine, weapons and ammunition. Importance is placed on decisions made during each turn, as the player has no direct control over events that occur once the end of the turn has been acknowledged by the game."

As you can see, specific systems are not described, just the overall plan for the game. We can worry about the details later. This design paragraph acts as a mission statement, something

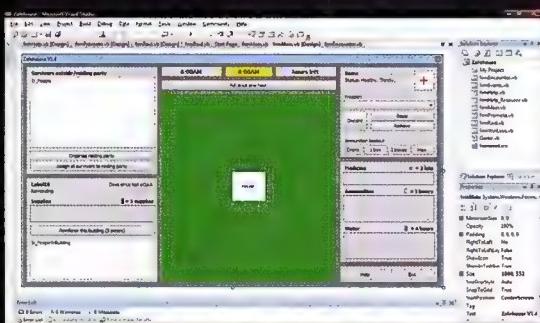**Random names - it's better than 'survivor 1', 'survivor 2', etc.**

to refer to when you feel like you've lost your way.

Other than Microsoft Word, which was used to write out design notes, Visual Basic .NET provided the coding environment and language.

Prototyping - your best friend

Oddly enough, the very first function to be coded for Zafehouse was the random name generator. It might not sound like a crucial function, but it was simple to do and gives survivors a little personality. In fact, the first iteration (or prototype) of Zafehouse was a window with a button and text box. Pressing the button would fill the box with a first and last name. That's it.

Each new prototype marked the introduction of a feature. While it was critical that functionality was added as quickly as possible, it had to be done one component at a time. That said, it was tempting to build and run the game after each line of code, but this was avoided, as it would have changed the focus from implementing features to bug fixing. The aim is always to create a complete experience – not bits of it.

Visual Studio's 'design' view, where all great user interfaces are made!

When you don't have time to create a proper plan, the user interface can provide waypoints instead. Flash, Visual Studio and a host of other dev environments make it simple to place buttons, panels and labels without having to code the behaviours behind them. As such, you can go through various designs in the space of minutes. Once you have something solid, you can then go and program what happens when those controls are interacted with. This is the direction that was taken with Zafehouse.

The building selection screen was the first UI element to be designed, so it made sense to start coding the logic behind a building click. This naturally led to the random placement code for the buildings, which then progressed to the building information box in the lower left of the game window.

Games we play

As the individual pieces came together, the actual gameplay of Zafehouse became apparent: Survive for 72 hours, or die trying. The player would progress one hour at a time, assigning survivors to raid for equipment, secure buildings or defend them. Along with keeping people alive, the player also had to manage various resources.

The first, and most important, resource is survivors. Survivors contribute significantly to the player's final score, as well as scavenging resources and keeping zombies out of buildings. Of course, if all the player's survivors die, it is game over.

Next up are weapons and ammo, which provide survivors with a means to protect themselves. Zafehouse has three melee weapons (fists, bats and machetes) and three ranged weapons (pistols, rifles and shotguns). Originally, ranged weapons would consume different types of ammunition.

ZAFEHOUSE: THE 10 STAGES

1. Pre-production and design: What's the game about? What makes it fun? How do you win? How do you lose? What are the features? How long should an average game take? Can it be done in the time provided (seven days)?
2. Feature implementation: What's realistic and what's not? Can this *actually* be done in the time provided? Is this too complicated? What does this add to the game?
3. User interface and control logic: Coding button presses, timed events, etc. Fleshing out the code 'skeleton' provided by step 2.
4. Core game logic and mechanics: Create data structures to store information. What happens when a player is infected? What happens when you run out of water? What happens when a building loses its reinforcement? What happens when the player wins or loses the game?
5. Play-testing, phase one: Does it all work? Is it fun? Is it playable? Is it too much, or not enough? Is it too random? Does the player have enough control?
6. New feature implementation/improvement/removal/optimisation: Take action on points identified in stages 5 and 6.
7. Play-testing, phase two: Do we need to go back to step 6?
8. Balancing and tweaking: Is the game hard enough? Is it too easy? Does the game last as long as it should?
9. Debugging and bug fixing: What if the player does something unintended? Can this variable accept negative values? Does the game crash? Can the game be completed?
10. Publishing: Package the game into a portable form and release it to the public.

Unfortunately, this could not be implemented in time. Instead, the more powerful guns would use more ammo per shot, which had the same effect as including ammo types of varying scarcity, but without the hassle of balancing their frequency. Ranged weapons also lowered the chances of the player being bitten, making them a kind of armour.

Early in development, food was another resource. However, when the game's turns went from days to hours, it seemed unlikely that survivors would require a constant stream of it over three days. The aim of having this 'passive' resource is to force the player to plan for the long-term. For instance, they could recruit 20 survivors and have enough people to defend all six buildings, but without water, this advantage would quickly turn into a liability.

Medicine provides a means to heal injured survivors. Survivors can take three hits before dying. Survivors can be healed to full using medicine, but it cannot cure the zombie infection.

Finally, there are barricades. Buildings can withstand zombie attacks equal to their barricade level, so players have to make sure they stockpile enough to survive the 12-hour night cycle.

These resources are gained primarily by raiding, though the

Zombies, bats and buildings... what a great mix.
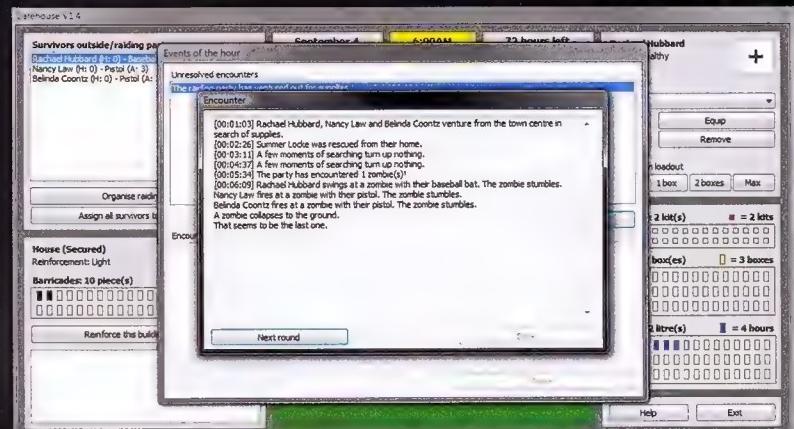
player can secure particular buildings to add an hour-by-hour stipend to supplement their supplies. Stockpiling barricades is much easier when the player is receiving a couple of units every turn.

Of course, no zombie game would be complete without, well, zombies... and infection. Both found their way into Zafehouse. When a survivor is bitten, there is a 25 per cent chance they'll contract the zombie contagion. Its effects are subtle, but nefarious – if an infected survivor dies during combat, they'll immediately come back as a zombie.

During the first play-through, surviving the 72 hours was the priority. With subsequent games, this changed to maximising the player's final score. So, we had fun, replayability and a working game, but there were a few elements missing.

A matter of balance

The core of Zafehouse was completed in just three days. The game was playable to its conclusion, even if the user interface

> ## " The final three days represented the home stretch, and it was the most grueling part... "
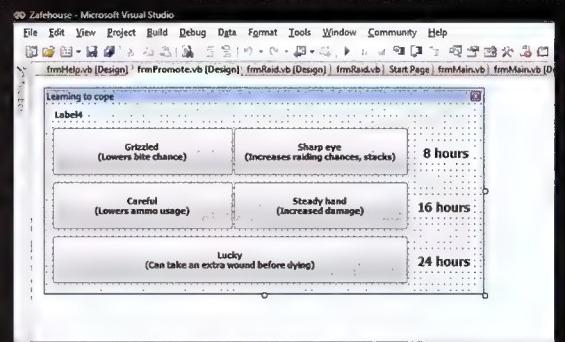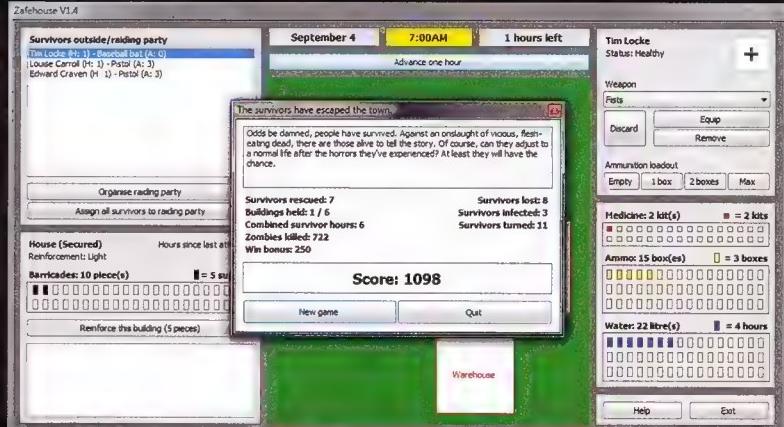
was rough around the edges. The day and night cycle was left out of the first major build, as it wasn't clear if it could be implemented and testing in the time that was left.

The only way to find out if the game was any good was to play it, and a solid 24 hours was spent doing just this. It provided an amazing degree of insight into implementation versus actual gameplay.

It became clear Zafehouse was too repetitive (every hour was similar to the last), there was no attachment to the survivors (the only difference between them was their names and weapons) and turns were not 'tense' enough. It was entertaining, in its way, but it could be better. The UI also didn't make it easy to discern how much of each resource the player had. However, with four days left, there was plenty of time to address these issues.

Perks were used to rectify the problem of survivor attachment. For every seven hours the player is able to keep someone alive, the player can select a bonus for them. The image top-right shows what perks made it into the final game,


Character perks help flesh out the survivors.

and their effects. Observant folk will notice perks such as Sharp Eye are better for early game, while Grizzled is more substantial for late game. It is decisions like this, and the player's ability to discern their relative value, that is core to Zafehouse's gameplay.

The repetitiveness and intensity were solved with the day and night cycle, which was already partially coded. Once completed, Zafehouse became a different experience. The player, unable to raid during the day, had to not only plan for the entire 72 hours, but the 12 hours of night as well. Running out of barricades or water in the middle of the night is hardly a happy experience.

Post apocalyptic
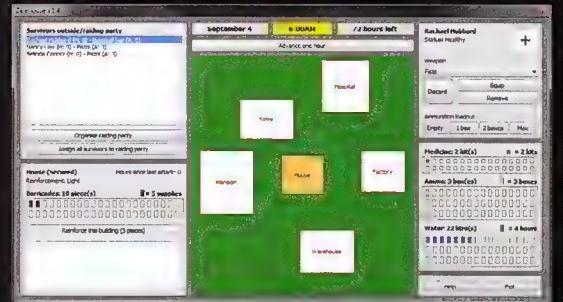
The interface of the main screen.

The final three days represented the home stretch, and it was the most gruelling part of Zafehouse's development. While bug-fixing and balance-tweaking was possible for one person, finding bugs and balance problems is easier with play-testers. As a game is developed, those behind it naturally 'learn' how it works. For example, early testing showed that players assigned little value to buildings, and would often forget to defend them, resulting in an early loss. As a result, building stipends were added to increase their worth.

If you'd like to check out Zafehouse, which did hit its seven-day deadline, head over to the Atomic website (**www.atomicmpc.com.au**) where you can download the binaries if you want to give it a try, or the source, if you'd like to tinker with the idea.

Happy surviving!

It's a terrible score, but at least we can finish the game.

Fallout 3 [Preview]

David Field flew to the States to get a look at this controversial new title in a classic series.

I have a question that I'd like to ask you, and I challenge you to answer with something other than 'Atmosphere'.

What single quality makes a game truly memorable?

Every other answer is just a smaller component of a game's atmosphere. Its storyline, gameplay, art and everything fold into the atmosphere as you play it.

The Fallout series was originally developed by Interplay in 1997, and has made it into countless lists of top ten games of all time. The latest instalment is being created by Bethesda of Oblivion fame. This is Fallout's first entry into the 3D realm, but the basic premise of the game is the same: nuclear war has forced humans underground into vaults for years, but something happened that has forced you to venture outside.

What you see when you walk outside the vault for the first time is hauntingly beautiful. This may be Washington, D.C. but the ground is scorched, hardened and yellowed. The water seems to have a viscous, murky green sheen to it. Even the sky seems barren. The whole game world looks and feels like a functional junkyard. This is what Pompeii would have been had it somehow been resurrected and recolonised after Mount Vesuvius erupted.

Everywhere you look, the world seems to be hanging together by threads. It's not just the husks of towns that have been nailed back together into ramshackle and desolate outposts - some of the in-game characters have been hit by the explosion and have had their skin ripped apart!

The characters you bump into while exploring the world all have unique personalities and their own agendas. Early on in the game, you head to the town of Megaton, where an ad-hoc religion has sprung up around an unexploded bomb. The mayor wants it dismantled. The preacher wants to convert people. A seedy character in the bar wants to blow it up and take the entire city with it.
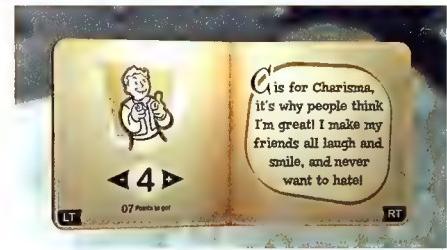
And the others just shrug off the whole situation.

This is just a microcosm of the huge and splintered world of Fallout 3, which shows how people deal with, adapt and interact with grim new surroundings and each other in the wake of a nuclear slate cleaning. Outside the walls of Megaton, an I-Bot drifts by, spouting propaganda from the President (voiced by Malcolm McDowell!) that drones on about how he's going

to save everybody. Nothing is ever clear in the game – even what passes for central leadership – since there are so many splintered factions.

Spoilt by choice

The choices and adventuring branches out quickly, and takes you all over the wasteland. You can go wherever you want (certain skills permitting), however you won't stand a chance in some areas if you walk in as a low level character. We found ourselves wandering over to the heart of DC, partly to admire the fantastic art direction of the shattered monuments and partly driven by a desire to explore. We walked up a flight of stairs and were blown away by edgy and paranoid militant NPCs.

We bumped into a pair of hardened and

seedy drug cooks trying to survive on the backs of miserable survivors. You can choose to run errands for them (or not) and sift through the layers of dialogue to uncover more about the world. Pick up items within their field of view and you'll be attacked, and will have to fight them off. Which leads to the beautiful combat system.

Although you can simply point and shoot at your enemies and take pot shots, you wouldn't want to. Fallout 3's RPG roots kick in when you decide to properly aim at an enemy. The world slows to a halt and your enemy's limbs are sectioned off in green, along with the likelihood of you hitting them and the damage you'll do.

There's more to this than just praying you'll hit the head to take them out quickly, because if you hit the arm they're using to fire, their accuracy will

fall. You can slow them down by aiming for the leg. It's all very nicely balanced, and an incredible blend of turn-based and real-time combat.

Just the stats, ma'am

Your character is governed by the SPECIAL system (Strength, Perception, Endurance, Charisma, Intelligence, Agility and Luck), in addition to a huge number of skills and perks that let you further define your character. As examples, the Swift Learner perk earns you extra XP; while Gun Nut gives additional points to your small guns and repair skills.

All of this is accessed through the immensely detailed Pip-Boy inventory screen. You'll find your maps, skills, inventory and everything in here, including a representation of your character and the amount of damage you've taken. Limbs have bar graphs that represent your health, and when you're limping around you can use the chems that you scrounge from the world to buff yourself back up to a decent amount of health.

Unlike Fallout 2, Fallout 3 will not contain an incredible array of pop-culture references. The developers chose not to include them because they felt it would distract from the game. "They're kinda cool, but they're also kinda jarring for the game world. You're playing a game and then

AND YOU CAN'T PLAY IT, BECAUSE...

Fallout 3 has been banned by the Office of Film and Literature Classification.

Why? Because it "contains drug use ... related to incentives and rewards". In other words, since Morphine is one of the chems that you can use and it will help your character briefly, the game has to be banned.

This is stupid for a number of reasons, not least of which include the numbers of games that have been on the shelves for years in which drug use benefits your progress and plays a vital component in the game itself. Not just MA 15+ games like Half-Life 2, Haze, System Shock and Duke Nukem – but a whole smorgasbord of M games like Starcraft and Battlefield: Bad Company.

The OFLC board took issue with the Pipboy screen, as it contained a "list of various 'chems' [with] small visual representation of the drugs, these include syringes, tablets, pill bottles, a crack-type pipe and blister packs." In the Board's view these realistic visual representations of drugs and their delivery method bring the 'science-fiction' drugs in line with 'real-world' drugs.

The guidelines also state that "Material promoting or encouraging proscribed drug use" is Refused Classification."

What amazes me about the decision is that in the wake of a huge list of games that feature incentivised drug use with no side effects whatsoever (apart from making the game easier for a period of time), Fallout 3 provides a host of negative side effects that you have to consider and deal with after you've used the drugs. You can, for instance, get addicted to morphine and alcohol in the game.

Fallout 3 will be one of the games that is held up as an example in the ongoing debate regarding games as an art form. That is, held up in every other country but Australia. The storyline, gameplay and its branching consequences provide a thought-provoking glimpse into a possible outcome of our world – one that's been in the back of human consciousness for years, and comes into focus every time we are forced to consider the cost of war.

Like so many that have gone before them, the developers may choose to edit the game slightly and resubmit it so it can limbo underneath the censorship bar and be reclassified as an MA 15+ game. It's akin to an astonishingly overweight member of parliament wearing a girdle whenever he knows that there are cameras near him.

And speaking of politicians, there's one man who's holding up the decision to introduce an R 18 rating to video games. His name is Michael Atkinson, the Attorney-general of South Australia. We have more information about this at **www.**

there's references to something that's completely irrelevant to your game world. It sorta takes you out of the experience, at least that's our feeling."

And from our hands on session, they're quite right. Everything just felt right in Fallout 3. Sure, it's guilty of feeling a little bit like Oblivion at times. This is understandable, as it runs a highly optimised version of the Oblivion engine and is made by the guys who made Oblivion. But as far as RPGs and even games in general go, it's got atmosphere in spades. Winner.

Brothers in Arms: [Preview]
Hell's Highway

War is all hell. And, David Hollingworth discovers, all flashbacks.

"**W**hat makes a man?" asks one of the characters in the opening cut scene of this World War 2 epic. "What makes," he asks again, this time with more meaning, more strings, more GRAVITAS, "a man?"

Well, according to the writers behind Hell's Highway, a goodly part of being a man is flashbacks, flash-forwards, over-wrought narratives and never being able to forget the past. It's a shame, really, as there is some fine action and strategic combat to be had in the latest in the *Brothers in Arms* series – one of the few WW2 shooters to actually bring something fresh to the rather strained genre.

That freshness is even, well, fresher in *Hell's Highway*, which just makes the soap operatic stylings of the linking plot that much more intrusive.

For those not familiar with the game's central mechanic, *Brothers in Arms* requires you to use cover, direct the fireteams of your squad, and carefully suppress and outmanoeuvre your enemies to defeat them. Running and gunning is simply not an option (or, at least, not a survivable one). That's back, of course, but whereas the first game seemed to be full of levels that seemed artificially packed with cover, the level designers this time around have found a far more organic look and feel.

Gone now is that sense that, if you fail, you're simply not finding the 'solution' to the level's tactical puzzle. Rather, a quick survey of each field of engagement will present a number of options: set up your MG team with a deep field of fire and advance your assault team by the flank, while you snipe? Or rush the enemy before they have time to set up their own positions? Or something else again?

The ability to properly hug cover only adds to your tactical options, and boosted AI on both yours and the enemies' side makes each firefight a truly individual – and often epic – event. That epic quality is only magnified by some fine graphical flourishes. As you fight or simply recon each area, flights of aircraft fill the air, and hundreds of paratroopers drop down around you. When the action heats up, particular shots or actions can sometimes drop the game into slow mo, where the camera suddenly focuses on whatever cool action you just pulled off: a headshot from a 100 yards, or landing a grenade perfectly in a bunker, just in time for a slow motion shot of the Germans hiding their getting blown about in what can be some rather graphic gore…

It's a vast graphical improvement too, thanks to the Unreal 3 engine. It also means the environment is far more chaotic, and certain little touches – like the trails of smoke from shells as they eject from a weapon – add a wonderful degree of verisimilitude to the entire game.

It's just a shame that after every few battles you get drawn back into the plot.

You play the same character from the original Brothers in Arms, Staff Sergeant Matt Baker of the 101st Airborne. He's an often morose guy, torn up by the losses his men go through, and still haunted by incidents from the Normandy airborne operations. Now, it's September of 1945 and his squad is part of Operation Market Garden. If you're not a war-nerd, it was the biggest airborne operation of the war, combined with a ground operation and air force cover. If you are war-nerd, then you're probably getting a little excited at the very thought of it.

So there he and his boys are, dropping into hell… which we get; war is bad, mmkay, but if we wanted to be reminded of those horrors we'd watch *Band of Brothers*, or maybe *Saving Private Ryan*. If we're playing a game, getting knocked over the head with that message repeatedly – and not too creatively, either – gets a little old.

Still, the cut-scenes at least provide a good break time to go for a wander and grab a Coke.

There are some other niggles, of course. The game is coming out on PS3 and Xbox, and that lineage is a little obvious and annoying on PC. There's the usual 'click to start' bit, which frankly has no place in PC games, and save system is checkpoint-based.

Despite their saturation, we really like World War 2 shooters. We really wanted to like *Hell's Highway* even more, as it covers a very interesting part of the war, and it improves upon what should have been a great mechanic in the original *Brothers in Arms*. It's still pretty solid, but the storyline and emotion is overplayed and gets in the way of your enjoyment.

VERDICT

Great graphics; real tactics for real results; excellent sound ✓

Overly emotional backstory; console flourishes ✗

ANTICIPATION RATING

7.0
OUT OF 10

Star Wars: [Preview]
The Force Unleashed

kssh The Force is strong with David Hollingworth *kssh*.

It's impossible – for us at least – to actually sit down in front of a Star Wars game and not feel that first little thrill of excitement as the music blares over the top of that now iconic text crawl. The one that opens The Force Unleashed informs you that Darth Vader is still up to his Jedi hunting tricks just after the Clone Wars come to an end; he's trying to hunt down one of the last of the Jedi, hiding amongst the still cranky Wookies of the arboreal planet Kasshyyk.

And then the game lets you play him.

As a gambit to show you the full potential of the Dark side of the Force, there are few more appropriate options. And potential there is, as Vader barely needs to even raise his lightsaber to defeat his enemies, the hordes of leaping and pouncing Wookies that stand between you and your prey. You can push them aside with ease, pick them up like ragdolls and smash them together, and you barely ever run out of force energy.

And if a few random Stormtroopers happen to get in your way, well, there's more my friend where they came from.

However, the phenomenal cosmic power doesn't last that long – once you best that first Jedi in a pretty destructive boss fight, Vader discovers

what he was hiding. The Jedi had a son, even more powerful in the ways of the force, and once the Jedi is dead Vader takes him as his apprentice.

The truth is that having now played the game, we really cannot wait to get back to it, and September is a long bloody time away! A part of that is of course that this is simply one of the prettiest games we've played in a long time, but a bigger pull – for a Star Wars fan, anyway – is that it really does have that epic feel to it. And not just in the gameplay, either (though, we do admit, the first time we blew a TIE Fighter to pieces using nothing more than the POWER OF OUR MIND we may have a giggled maniacally). The story is suitably wide in scope; Vader is training his apprentice so that they can one day take on the Emperor, which was exactly what Vader wanted to do with Luke in The Empire Strikes Back. Knowing that you're a part of that great tale is pretty neat.

And, of course, it's not all sore on the eyes.

The brilliant combination of the Havok physics engine and Digital Molecular Matter simply cannot be overstressed. All of those videos of Stormtroopers holding hands as you try to fling them about might have looked a bit funny, but it rarely happens in the game. It can, but the pacing of the game makes it more of an aside than a feature – a stunning technical achievement of an aside, yes, but not the focus of the action. Rather, you're able to stride down corridors, flinging control panels, pushing aside barriers and other cover, arcing lightning into the environment and then throwing it at your enemies… the sheer combinations of things to do and ways to do them is almost boggling. The frame rate, even at this stage, is super solid on the 360, and the environments we looked at either free of drop-in

or well-designed enough so that it's never noticed.

The controls play well, too, and are also suggestive that simply hacking away with your saber is not the prime way to face down your enemies. The controls combine well, so that you can use the trigger to lift something, then move it with your thumbsticks; if you want to throw it, simply point a stick in the direction you want to throw and release the trigger. With just a little practice, we were flinging enemies literally over our shoulder, or simply bring them closer so that they could be impaled on the elegant Jedi weapon of choice.

You may have already worked this out (and we did give it away somewhere up near the first paragraph) but we're really looking forward to getting back into Starkiller's dark Jedi shoes. We're expecting some very good things – once again – from The Force Unleashed, and we're now expecting it to deliver.
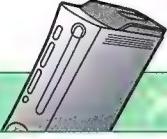
XBOX360

Developer **LucasArts**
Publisher **Activision**
Website **www.lucasarts.com/games/ theforceunleashed/**

VERDICT

✔ Detailed environments; unmatched physics and damage modeling; it's fucking Star Wars

✘ Imperial class Star Destroyers are not in fact capable of atmospheric flight, as early sequences seem to suggest.

ANTICIPATION RATING

8.5

OUT OF **10**

Midnight Club: [Preview] Los Angeles

Needs must when the devil drives David Hollingworth. Or something.

The Midnight Club series of racing games has a long and rich heritage. Hell, its name actually comes from a real driving club in Japan! Now the latest, and first next-gen iteration of the series, Midnight Club: Los Angeles is revving its souped up engine in preparation for release.

We recently got a chance to tool around the game's reasonably complete LA rendition at Rockstar Sydney. Like so many modern games, this is one that is really best experienced in full HD, with a surround sound system, and on a comfy couch.

There's been a lot of hoo-ha about just how big this game's version of LA will be; having now played it, it's certainly not anything like the whole city (which, if you've ever been to or even just flown over LA, would be simply ludicrous), but rather a selection of the most iconic and representative bits mashed together to make a city that while not accurate, certainly seems real. It's a Hollywood rendering of the place, if you will, and there are certainly more than enough real life landmarks to catch. In one of our races we zoomed by the celebrity guesthouse the Chateau Marmont. There was, sadly, no sign of any dead stars, or of Britney Spears being kicked onto the street. Such a wasted opportunity…

The Rage engine in this game is a far more polished beastie than in GTA IV, thanks to the fact that the game is far simpler – it doesn't have to worry about rendering environments to players on foot, or as many pedestrians and what they might do in retaliation for the mayhem inflicted on them by our favourite eastern European mercenary. Instead, the engine can fully render detailed cars, environmental effects, and all the neon brightness of the City of Angels, with nary a stutter.

In a lot of driving games, even sandbox games like Midnight Club, it can be hard to take in the pretty sights. MC:LA has a unique system to make sure you can spend as much time cruising as you do racing for reputation and hard cash.

There's practically no menu system in the game, as all of your racing and assignations are handled more or less in-game. In fact, it's quite easy to never leave your car at all, as you can manage races and challenges via a Blackberry-like device, and then simply follow the colour-coded icons on the mini-map to find the race. There are even random opponents driving about the world that you can simply flash your high-beams at to challenge. As they are constantly moving, the parameters of each race will be unique, especially the open dashes that simply require you to reach the finish without messing about with such annoying things as checkpoints.

And when you do get in a race… well, let's just say you'll have a serious urge to strap yourself in to that comfy couch we mentioned earlier.

The sense of speed and barely in control acceleration is simply un-rivalled. Buildings zip past, pedestrians dash out of the way (and no, you can't run them down), and all the while the revving of your engine and the squeal of tyres is screaming in your ears. It's almost WipeOut-esque in its sense of hurtling velocity.

And for all of that impending sense of smashy doom, it's surprisingly easy to control, too. You might always feel on the edge of disaster, but it never really comes… well, not much. The damage model is also very forgiving, and while performance may degrade, you can easily survive all kinds of normally fatal encounters.

In between racing, you can play the usual game of making your car – and there'll be many real world vehicles to aim for – look exactly how you want it to. Pretty much every bit of your car can be lit, painted, raised, lowered, upgraded or in some way tweaked. There's a very robust system of colours and decals, too, so no matter how over the top your vision, you'll likely be able to realise it.

Midnight Club: Los Angeles is shaping up to be a great racing title – not so simulationist that only those with actual drivers' licenses can get into it, but nor is it overly simple and arcadey. In other words, it's the just-right street-racer that we can't wait to see more of.

Developer Rockstar San Diego
Publisher Rockstar Games
Website www.rockstargames.com/ midnightclubLA/

VERDICT

✅ Graphically slick; fiendishly fast; no distracting menus

❌ Easy-going damage model does not reward good driving

ANTICIPATION RATING

8.0 OUT OF 10

Too Human [Preview]

David Hollingworth gets God-like before passing out in a feasting hall and forgetting his password to the Underworld…

When it comes to the many religions of the world, past and present, there's one pantheon that stands head and hairy shoulders above the rest. The Norse, with their rich legendarium of Gods, giants, elves, magic swords and betrayal and bloody revenge, really lucked out when it comes to epic takes you can be proud of.

So, taking their cue from one of the bloodier pantheons ever must have been a no brainer for the devs at Silicon Knights. That they came up with it last century, and have continued to plug away at this tale of gods and machines at war, is a testament to their commitment.

And yes, we said Gods and machines… this ain't your normal take on Norse mythology.

The Aesir, as the Norse Gods were known, derive their power not only from being more or less superhuman, but also from the vast amounts of cybernetic upgrades they have access too. An Aesir in combat is an image of a pure engine of destruction, switching calmly between blasting away with ranged weapons and hammering or slashing with abandon using ancient technologically enhanced melee weapons. Thor, for instance, is a hulking brute in ragged power armour, with a hammer that practically throbs with power. His muscles are augmented by cords of mechanical parts, making him super strong and resilient.

Regular humanity in *Too Human*, are the servants and grunt soldiers. Wolf squads operate in numbers, supporting each other to take down their enemies, while individual Bear warriors use strength amplifying harnesses to take the fight to the enemy one-on-one.

The whole world has been very well thought out, and while it may not sound it, it's a rather elegant match that never seems odd. Probably the best transliteration of the old mythos is

that in this technological version of the cycle, cyberspace is very important; while the natural world is a ravaged, post-apocalyptic waste-land, it's in C-space that the natural world-that-was is remembered.

It's also an important gameplay element. There are many doors or similar items you'll need to open, and to do that you must jack in; once online, you'll need to find rune-covered rocks in the secluded forest-glades of cyberspace, or talk to the Norns who control this artificial realm –and who are having their own issues with the a mysterious program-devouring entity.

However, you'll spend most of your time in Too Human leaping about shooting and cutting down evil machines deadset on destroying humanity. Not only are you protecting what's yours, you're trying to get your bloody revenge for the ravages of those machines – they've already had you in their clutches once, and they killed your wife. To say their's a rich back-story at play is bit of an understatement…

Still, it never really gets in the way of all the mayhem.

If anything, *Too Human* is very reminiscent of *Diablo* in its basic gameplay. There's more emphasis on combos, and it takes the mixing and matching of arms and armour to a nearly obsessive degree, but basically the game is all about mowing down hordes of badguys, plundering whatever loot floats up from their dead corpse, and then moving on to the next horde or slightly more involved boss-fight. So, maybe not so much *Diablo* as *God of War* with assault rifles and cybernetics.

There's actually a surprising amount of depth to the combat, too. You'll need to balance ranged weaponry against close-in killing, and the game's control scheme makes it not only cleverly simple, but also in a way that makes you feel like a total

bad-arse. Shooting is done via the right-trigger on the Xbox controller, while the right-stick controls your directional melee attacks – there's no need to switch weapons, either, as simply pulling the trigger auto-equips your ranged weapon, while tweaking the stick auto-equips your sword or hammer or whatever else you like to mash heads with. It's an elegant solution and plays wonderfully, allowing you plink away at range and then seamlessly switch to melee, and back again, as you need.

There's on and offline co-op to get to grips with, too, and the different class choices really come into their own when you're playing with a mate.

Overall this a polished action game, with a surprisingly good background story. It's no *Mass Effect*, for sure, but we think you'll be pleasantly engrossed following Baldur's tale of revenge and humanity triumphant.

XBOX 360

Developer **Silicon Knights**
Publisher **Microsoft Game Studios**
Website **http://toohuman.net/**

VERDICT

Frenetic action; great story; inventory manager's wet dream ✓

Some camera issues; some class choices seem weak ✗

ANTICIPATION RATING

7.0

OUT OF 10

CULTURESHOCK

The Dark Knight

DVD/MOVIE Directed by Christopher Nolan, Starring Christian Bale, Heath Ledger, Aaron Eckhart, Michael Caine

Origin stories are a staple of the superhero genre, and they're often how we are introduced to a new character in a filmic sense. When Christopher Nolan and Christian Bale rebooted the Batman film franchise with the acclaimed Batman Begins, we saw what drives Bruce Wayne and inspired him to become the caped crusader. In the upcoming Wolverine, we'll see the origin of everyone's favourite immortal regenerative canuck; origin stories are as important to the superhero genre as the three-act framework was to early drama writers.

So, then, when we find a character without an origin, with no seeming past at all, it's a jarring event. It's that disconnectedness that makes The Dark Knight so compelling, and at the heart of that disconnect is one insane man...

The Joker.

In many ways 'The Joker' could easily have been the name of this film. In some ways it should have been – certainly, Heath Ledger's performance is worthy of star billing. But this film is very much about not only the Joker, but his relationship to Batman. It explores – though possibly not as deeply as the first film – Batman's own dark psyche, and sets up that exploration for many films to come.

The film opens with a frenetic bank robbery that quickly turns into a whirlwind of betrayal. From there we cut back and forth across Gotham in a series of scenes intercut with such pace that in any other film would be considered the climax. As the action mounts, we're re-introduced to old friends and new characters – Lieutenant Gordon, now heading up Gotham's Major Crimes Unit, Lucius Fox, still heading up day to day operations for Bruce Wayne, and of course Harvey Dent, Gotham's new District Attorney and a staunch foe of the crime and corruption that has plagued the city.

Also present is a new face on an old character. One of the few low points of Batman Begins was Katie Holmes' Rachel Dawes; her fresh wholesomeness just didn't seem to belong in Gotham, let alone as Bruce Wayne's love interest. Maggie Gyllenhal, on the other hand, is an excellent foil, and her Dawes is as hardnosed about pursuing crime as any of her male counterparts. She's also a far better actress.

But stealing the entire show, as we've said, is Heath Ledger, giving what is easily the most intense performance of his sadly foreshortened career. His Joker is never easy to pin down, never easy to simply explain away as the product of some catastrophic encounter. Batman does what he does because of the violent death of his parents; the Joker, though... well, he has his reasons, but they're simply not to be understood by sane minds. Each time we see the Joker it's impossible not to feel uncomfortable in his disconcerting presence. For our mind you can take your Freddies, your Jasons and other screen screamers; Ledger's Joker is easily one of the most terrifying antagonists the screen has ever seen.

Everyone in the film is great, from Gary Oldman as the embittered but passionate Gordon to Aaron Eckhardt as the tragic Dent. Christian Bale isn't quite the presence he was in the first film, but then he has less to work with this time around. There are a number of scenes towards the film's end, however, where he is at his best, and the film's conclusion leaves you in no doubt that the Batman is truly the dark mirror of the Joker, with just as much a will to do what he believes in, what he believes is right.

It is a long film, though, and some may get a touch of 'climax fatigue' towards the end, but there's no doubting that The Dark Knight raises the bar for superhero films almost impossibly high. **DH**

SCORE 9.5 OUT OF 10

A girl's eye view of the geek side

Geek girl seeks nostrum with GSOH

Zara Baxter knows how to deal with embarrassing geek secrets: tell the Atomic readership!

I have a confession to make, oh Atomicans. My revelation will damage my geek cred severely, and you may even snicker – everyone in the office did – but I need your help.

See, a while back, a friend invited me to co-op with him on *Natural Selection*, the *Half-Life* mod. He thought it'd be my kind of thing, and what could be better than geeking out together, right?

Except that games make me want to vomit. Not in a that-game-is-garbage way, but in a the-world-is-spinning-uncontrollably-which-way-to-the-toilet way. It happens with first person perspective – I also get nausea with limited third person, but if you get the camera high enough so that yea verily, I am like unto a God to those game minions, I'm fine. Score one for megalomania.

The reason is proprioception – our body's sense of position and motion. We get information about position from stretch receptors in our inner ears, muscles, tendons and joints and our brains put together the whole picture. We normally rely on visual cues for a lot of positional information, but not all – try writing 'proprioception' on a lined piece of paper with your eyes closed, and you'll quickly spot that forming the word doesn't need vision, but hitting the line accurately does. When our body and vision have different ideas about position and movement, nausea can result.

My brain is fine when my body is moving but the horizon isn't, but switch things around and the poor thing gets a little confuzzled.

It all began with *Descent*, which I started playing on an Amiga 2000, back in the day. And I stopped about three minutes later, clutching my stomach. Three minutes of play caused 40 minutes of extreme nausea.

I've dipped into first person games now and then, to see whether the nausea-triggering had gone away of its own accord. But alas, I couldn't play Quake, Tomb Raider, Half-Life or Far Cry. I was left with only turn-based games that didn't trigger me too badly. And Diablo – I'm looking forward to Diablo III, even if it is a total point-and-clickfest, just because it's one of the few real-time third person perspective games I can play without problem.

It's not all bad news, though. More recent game engines have better motion handling, graphics cards now render faster relative to your mouse or keyboard input, and more recent monitors smooth motion, all of which reduce the in-game nausea. I can play *Crysis*, and I can play *Call of Duty* – which is fortunate, because they're PC Authority's benchmark games. I also loved *Portal*, but I had to play it in 20 minute chunks (no pun intended).

My problem seems to be, if not common, at least relatively frequent among other geeks. Some estimates are that one in four people suffer from game-related nausea. And because it's a frequent problem, there are a few proffered solutions including:

- Increase your monitor's refresh rate.
- Play in a room with lights on, rather than a dark room.
- Ensure you get more than 30fps to reduce flicker, which can increase nausea.
- Move your head around (My ex used to do this compulsively, which was pretty amusing to watch. He also stuck his tongue out while battling the big boss critters).
- Motion sickness pills.
- Get a smaller monitor (HAH!).

But there's still a bunch of games I can barely look at, much less play. So here's what I need from you all: suggestions to fix the nausea. My plan is to use *Half-Life* – the most nausea-inducing game to track and graph the length of nausea vs gametime for each potential cure. It's practically made of science!

> **My problem seems to be, if not common, at least relatively frequent among other geeks.**

Zara Baxter once googled emetophilia, just to see if anyone really did fetishise vomit, but really wishes she hadn't. Mock her lack of gaming skillz at **zbaxter@pcauthority.com.au**
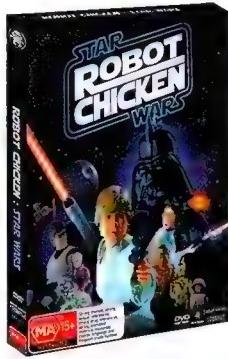
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TECHNIQUE

HANDS-ON TUTORIALS FOR THE TECHNICALLY INCLINED

It's a time of endings and beginnings for your learning bone this month. We rap up our introductory Linux series with at all important sharing and file permissions, which should see you – after the last two parts – well on the way to being as comfortable with UBUNTU as you are with Windows.

On the beginning side of the ledger, though, Ron is back (with a brand new invention). This time we're going back to basics, and looking at case fan installation. From the simple up to the cut-your-PC-to-pieces approach, we're looking at ventilation from base principles, and how to find the best solution for your PC requirements.

There's the usual edumaction (and that's not a typo) piece from Chris Taylor, a range of troublesome tech questions, with assorted answers, from Dan Rutter, and even a surprise Atomican roundup to close out the issue.

TECHNIQUE CONTENTS

DIFFICULTY **INTERMEDIATE**
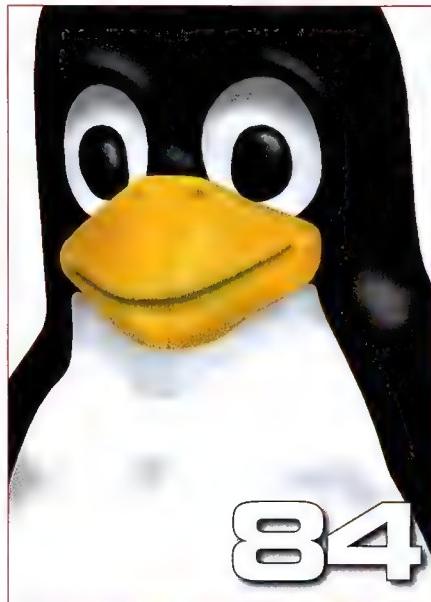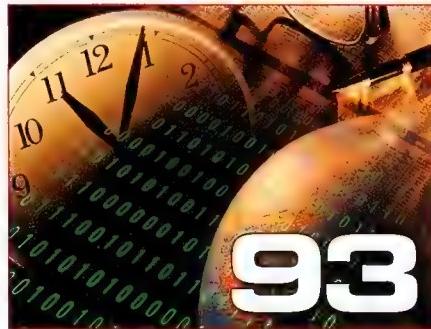
Linux for Windows users pt3

Liegh Dyer tells us everything we need to know about file permissions with Ubuntu.

Unless you live in a bubble, you're probably not the only person that needs access to your PC, and your PC probably isn't the only PC on your network. Linux can share files with Windows PCs like a champ, but to do it successfully, you need to know a bit about Linux file permissions.

Permissions

Linux is quite restrictive with its permissions, which is why regular users can't install software or perform much in the way of maintenance without gaining administrator privileges first. This restrictive model extends all the way down to the filesystem. Linux (and UNIX) permissions are simple in construction, though, since every file and every directory has just three sets of permissions: one for the user that the file belongs to (the 'owner'), one for the group that the file belongs to, and one for everyone else.

The clearest way to see permissions is by looking at the output of the 'ls –l' command, which contains a string that looks a bit like this:

```
-rwxr-xr-x
```

The first character represents the type of file – a '-' means a file, while a 'd' is a directory and an 'l' is a symbolic link. The three sets of three characters after that are the permissions for the file owner, group, and everyone else – the 'r', 'w', and 'x' represent read, write, and execute permissions respectively. Read and write are fairly self-explanatory, and on files, execute access determines whether or not you can run the file as an executable.

For directories, the permissions are slightly different. To access a directory, you need both read and execute permissions. Write permission on a directory determines whether you can create or delete files, since these are considered to be modifications of the directory. Oddly, this means that you can delete any file in any directory you have write access to, even if you don't have write access to those files.

Having such a simple model makes permissions very easy to read: you're either the file's owner, or you belong to the file's group, or you're someone else, and once you've worked out which one applies to you there's only three possible permissions you can have. However, setting permissions can be complex in multi-user situations.

As an example, we'll take two users, 'alice' and 'bob', who need to share access to a the '/home/alice/stuff' folder. Only one of them can be the owner, so you can't give them both full access directly. Instead, you use groups:

1) Open the 'Users and Groups' tool from the System/Administration desktop menu. Click the 'Unlock' button and enter your password to gain admin access.
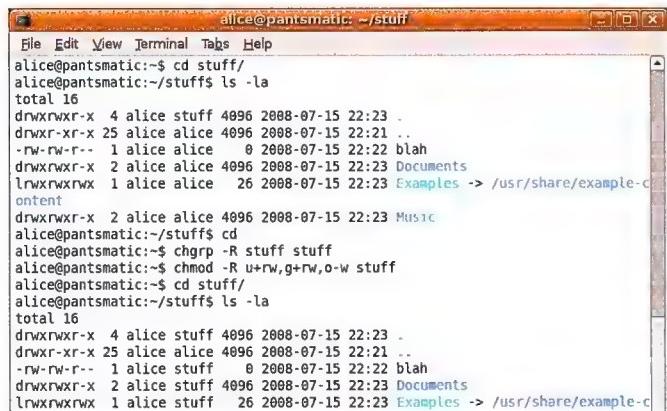
file type	user permissions	group permissions	"other" permissions	hard link count	file user (owner)	file group	file size	last modified date	file name
d	rwx	rwx	r-x	2	alice	users	4096	2008-08-01 12:54	blah
-	rw-	r--	r--	1	alice	users	15072	2008-07-29 11:30	file.txt

▲ **The full 'ls' output lists, among other things, the file owner and permissions.**

▲ **Use the 'Users and Groups' tool to manage groups.**

atomic

2) Click on the 'Manage Groups' button to open the group manager.

3) Click on the 'Add Group' button. Enter a name for the group (we'll call it 'stuff' in our example), and then tick the boxes next to 'alice' and 'bob' in the 'Group Members' list.

4) Click 'OK' to create the group.

5) Open a terminal and run the following commands to change the group and permissions on the 'stuff' folder and its contents:

```
cd /home/alice
chgrp -R stuff stuff
chmod -R u+rw,g+rw,o-w stuff
```

The 'chgrp' command changes the group, while 'chmod' changes the permissions, in this case adding read and write permissions to the file owner ('u') and group ('g'), while removing write permissions for other users ('o'). The '-R' option is what tells these commands to apply the changes recursively. Without this, each command would change just the "stuff" folder itself, but nothing below that.

▲ 'ls' shows the changed group and permissions.

Now, everything in the 'stuff' folder will have 'stuff' as its group, with full group privileges. Since 'alice' and 'bob' are both in the 'stuff' group, they have full access to all of the files, regardless of the file owner. There's just one catch: new files won't automatically inherit the new group or permissions.

There are two ways to make sure the new group is set properly. Each user has a primary group, which is used by default on all files created by that user, so one way to fix this is to use the 'stuff' group as the main group on your two users. The other is to use the 'set group ID' (or 'setgid') bit, which when set on a directory applies the directory's group automatically to any files created within it:

```
cd /home/alice/stuff
chmod g+s .
find -type d -exec chmod g+s {} \;
```

We only want to set the 'setgid' bit on the directories, so we use a single 'chmod' on the 'stuff' directory itself, and then use 'find' to list all the directories below that and run 'chmod' on each.

For the actual permissions, the only solution is to change the default permissions for both users to allow full group access. To do this, edit the '.bash_profile' file in each user's home directory (you can use 'nano', like we covered last month) and add the following line:

```
umask u=rwx,g=rwx,o=rx
```

The change will take effect on each user's next login.

Windows networking with Samba

Linux can interoperate with Windows networks using Samba, a server application that implements various network protocols. Samba works well

EXTENDED PERMISSIONS

If you're used to managing user permissions using Windows ACLs (Access Control Lists), then the simple UNIX model used on Linux might seem like quite a step back. It's important to understand the UNIX model, since you'll be using it a lot, but Linux does have its own ACL-style system, called POSIX ACLs, which you can use to manage permissions just like you can on Windows. The main catch is that tools like 'ls' don't understand these advanced permissions, so the permissions they show may not be accurate, though 'ls' does at least indicate files that have ACLs applied to them, by showing a '+' next to their permissions.
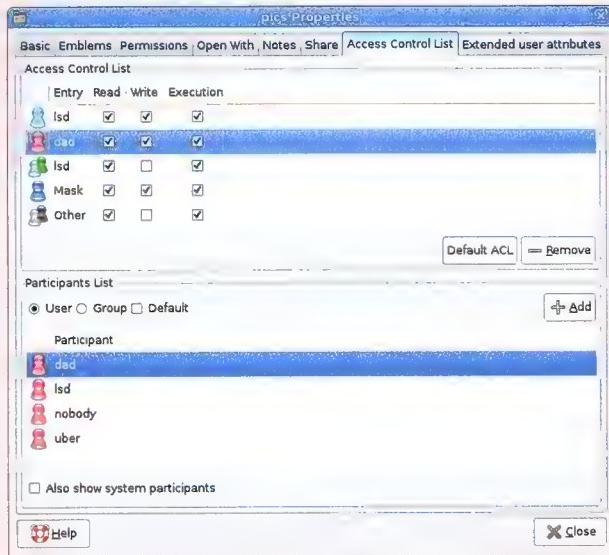
▲ Eiciel gives you GUI access to POSIX ACLs.

POSIX ACLs are available and enabled by default, but you need an editor to work with them, like 'eiciel' (in the 'eiciel' package), which adds an ACL panel to the file manager's 'Properties' dialog. Unfortunately, it can't set permissions recursively, which limits its usefulness.

The alternative is two command-line tools in the 'acl' package: 'getfacl', which lists the ACL on a file or directory, and 'setfacl', which edits ACLs, and which has a '-R' recursive option just like 'chmod'. To add or edit an access control, use the '-m' option – the following grants 'alice' full access, and strips 'bob' of any access:

```
setfacl -R -m user:alice:rwx stuff
setfacl -R -m user:bob:--- stuff
```

enough that you can run it as an NT domain controller on a corporate network, but it's more commonly used for running file shares.

There's some support for setting up Samba through the file manager, so you can set up simple shares by right-clicking on a folder and selecting 'Sharing Options', and Ubuntu will even automatically prompt you to install Samba if required, but it limits you to just the most basic options. The alternative is to edit the Samba config file manually:

1) If you don't have Samba installed, install it using aptitude:

```
sudo aptitude install samba
```

2) Open the '/etc/samba/smb.conf' file in a text editor:

```
sudo nano /etc/samba/smb.conf
```

▲ Ubuntu can install Samba automatically through the file manager.

3) In the '[global]' section near the top of the file, find the 'workgroup' line, and change it to the workgroup in use on your network:

```
workgroup = PANTS
```

4) Scroll down to the authentication settings and find a line which reads 'security = user'. Edit this line to remove the semi-colon at the start.

5) Scroll to the end of the line and add the configuration for a share. Use the following as a model:

```
[stuff]
    path = /home/alice/stuff
    browseable = yes
    public = no
    writable = yes
    create mask = 0775
    directory mask = 0775
```

6) Save the file, and then restart the Samba service to make the change take effect:

```
sudo /etc/init.d/samba restart
```

7) Use the 'smbpasswd' tool to set your Samba password. Unfortunately,

▲ Add shares to your Samba configuration manually.
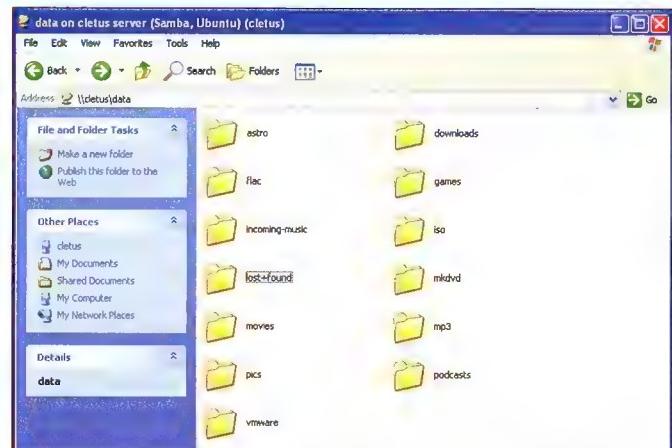
▲ Browsing Samba shares from Windows.

Windows and Linux use different password encryption schemes, so Samba can't use your existing account passwords. Each user can run 'smbpasswd' individually to set their own passwords, or you can run it as an admin to set the password for a specific user:

```
sudo smbpasswd alice
```

The above share configuration creates a 'stuff' share, which maps to the '/home/alice/stuff' folder. It will be visible in the file manager, rather than being a hidden share ('browseable = yes'), will require a login ('public = no'), and will be read-write ('writable = yes'). The underlying UNIX permissions remain in effect though, so you still can't write to files you don't have access to.

The 'create mask' and 'directory mask' options are along the lines of the 'umask' option we added to the user configurations above – they ensure that any created files or directories are given full group access by default.

If you need to create extra shares, simply make more copies of the share configuration, and edit them accordingly.

▲ The file manager can open Windows shares seamlessly.

Browsing shares

Of course, you can also open Windows shares from your Linux box, just by browsing through the network in the file manager – if you've been playing around, you've probably discovered this already. Only applications that use the GNOME libraries can actually open files on these shares, though, in much the same way that older Windows applications don't support UNC paths.

There is a backdoor way around this, though. Once you've opened a share in the file manager, it appears as a new folder inside the hidden '.gvfs' folder in your home directory, and this folder can be accessed by any application.

Adding hard drives

If you're like me, it doesn't matter how much hard drive space you have, it'll eventually run out. Adding a new drive isn't too tricky, though -- you just need to partition and format the drive, and then add mountpoints to add the new partitions to your system. Once your drive is physically installed, the best tool for partitioning and formatting is GParted, in the "gparted" package, which appearas as the "Partition Editor" option in the System/Administration desktop menu.

GParted, and Linux in general, doesn't allow you to edit drives that have any partitions currently mounted, but for a new drive this should't be a problem. If you do ever need to edit partitions on your system drive, though, use the Ubuntu CD to boot in to a live system and install GParted there.
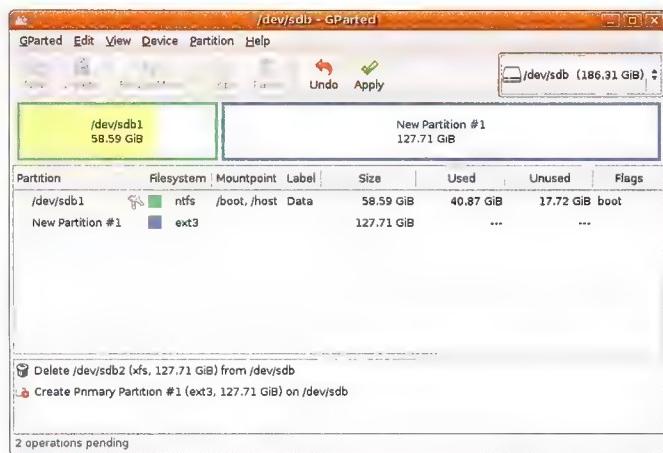
▲ **GParted can create, delete, and edit your partitions**

GParted is pretty straighforward -- select the drive you want to edit using the drop-down in the top right, and then create/edit/delete your partitions. When formatting, use either the "ext3" or "xfs" filesystems, since these are the best all-rounders. GParted doesn't actually edit your drives until you hit the "Apply" button, so you can mess around without making any permanent changes.

To mount the new drive, make a note of the device name listed in the "Partition" column, and run the "vol_id" command on it:

```
sudo vol_id -u /dev/sdb1
```

Then, open the "/etc/fstab" file in a text editor:

```
sudo nano /etc/fstab
```


▲ **The "fstab" file lists partitions and their mountpoints**

Each line in this file represents a mountpoint. Copy one of the existing mountpoints, and replace the UUID with the ID from "vol_id" above, and set the path to where you want the partition mounted. On my system, I have my large drive mounted at "/data" -- it's non-standard, but it works for me. You need to create an empty directory for the mountpoint too, like so:

```
sudo mkdir /data
```

Your new drive should mount automatically the next time you boot. In the meantime, you can mount it manually with the "mount" command:

```
sudo mount /data
```
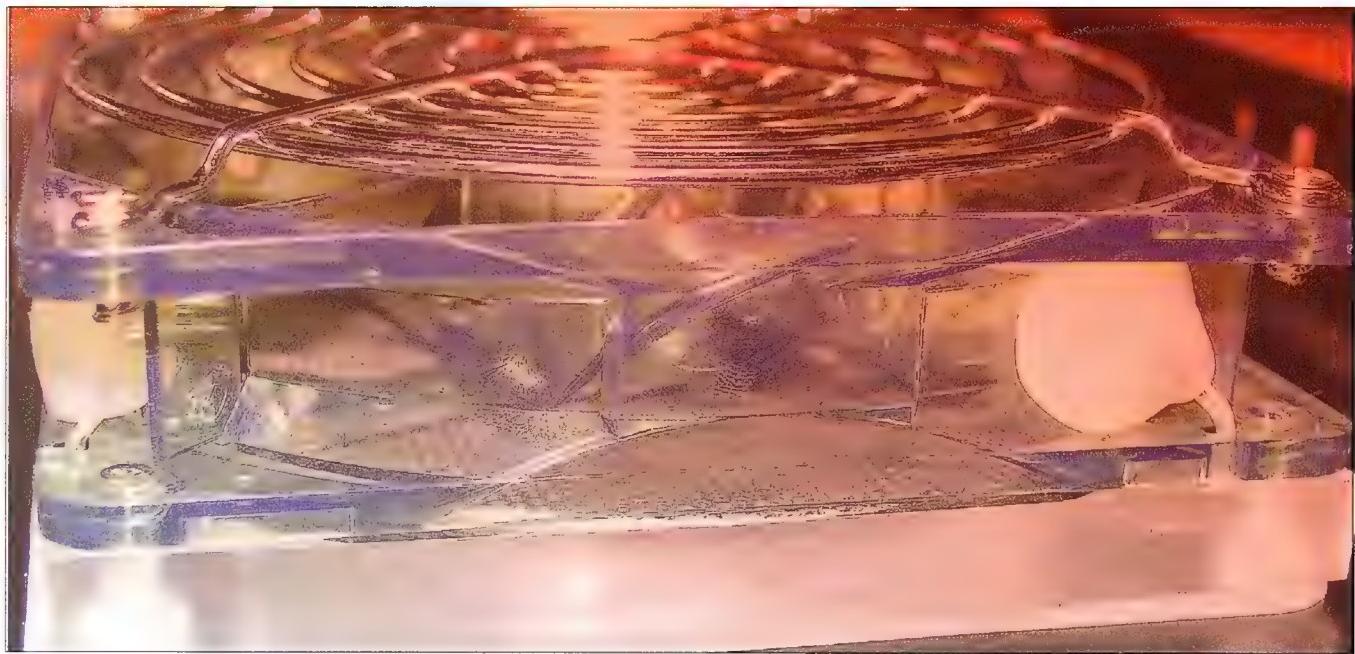
DIFFICULTY **ADVANCED**

Fitting Fans

Ron Prouse gets back to basics and blows us away.

After some of the 'advanced' tutorials over the last few months, the request has been made to get back to basics for a while. The reason is quite simple: every issue a new batch of readers discover Atomic, and every month there are new people who have become inspired to modify their computer. The conundrum they face is where to start. For many, the easiest route is to buy as many 'bolt-on' accessories as possible, stuff them into an already custom-look case, and consider that the job is done. This 'instant mod' approach requires minimal effort, very few tools and almost zero skill – and, in reality, there's nothing wrong with that! At least the owner has created something that is more of a reflection of their individuality than the box that they started with. The only down side is the very strong possibility of encountering an identical creation at their very next LAN!

On the other side of the ledger is the realm of the uber-modder, designers and fabricators of the most amazing and breathtaking creations that one could ever imagine. These guys could show MacGyver a thing or two about resourcefulness, while displaying master skills and originality. They are also very few in number.

Somewhere in the middle is, arguably, the most interesting group of all – people who are prepared to invest some additional effort and skill to create an individually crafted PC, without having to spend two years sequestered in a workshop to get there. For want of a better term, consider them as 'serious' modders. For these people, and those who aspire to be, we are going to re-

▲ **Subtle or extreme, functional or fantasy, the modding choice is yours…**

▲ Metal filings and PC hardware can be such a fun mix when you add electricity.

visit some of the basic guides that we did seven years ago, with the hope of inspiring a new generation of modders to build truly unique cases.

And it doesn't get more basic than adding a fan to your case – or does it?

That really depends on the builder, the style and the construction of the case. We are going to look at a few different applications, and briefly walk through the process.

> ## " Our advice is that case modding should only be performed on an empty case... "

Firstly, an expansion on the usual disclaimer, mainly to cover our butts but also to protect yours. Whenever you cut metal there will be inevitably be metal filings generated, just like the crumbs and salt that invariably accompany empty chip packets. While foodstuffs will merely clog up your keyboard and mouse, metal filings have potential to cause electrical short circuits that can prove terminal to your PC hardware, and perhaps even you – think of an angry 240V power supply…

Our advice is that case modding should only be performed on an empty

▲ Simple mods are a great place to learn the basic skills – and still be visually effective.

case, with all of the PC components safely tucked away until it is time to re-assemble. This will avoid tears later on.

Blow me

The simplest fan mod is the removal of a factory punched-out grill and replacement with a simple but elegant chrome wire guard. The process is as straight-forward as it looks – remove the fan, cut away all of the existing metal and screw it back together. That's the theory, but the reality can be a little more complicated depending on the tools that you are using. Best results will be achieved using a fine cutting tool (hacksaw, jigsaw, Dremel cutting wheel)
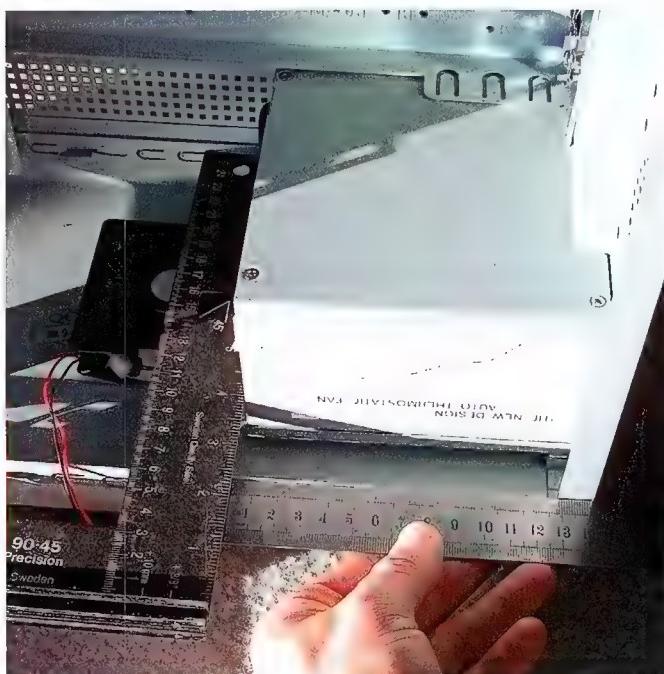
▲ Length does matter, regardless of what she may have told you.
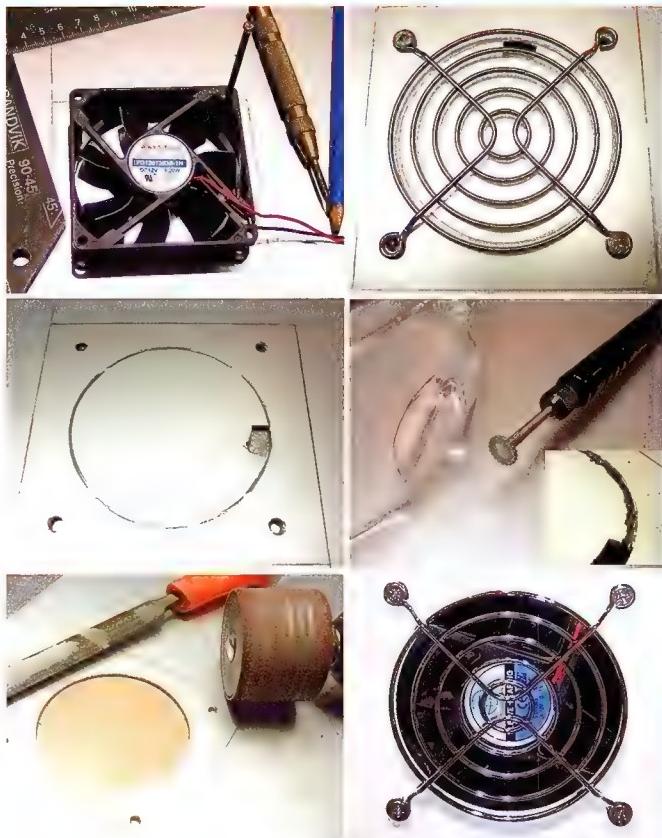
When you look at it like this, it really is pretty straightforward.

to 'nip off' the OEM grill around the perimeter of the hole, and then remove any sharp edges, or burrs, with a metal file. The final step is to smooth off the opening with sandpaper and, in the case of steel, coat the cut edge with paint to stop rust – in small area's like this, clear nail polish will work as well as anything else!

When you are adding a new fan port, the modus operandi is very much the same, but with a few additional steps; the first and most important thing being location. There is no point adding a fan, and then discovering that it impinges on another component – one of the more common mistakes is adding a top blowhole only to realise later that it is in the way of the PSU!

"Most pencils wont fit inside the holes, so the use of a centre-punch will help...
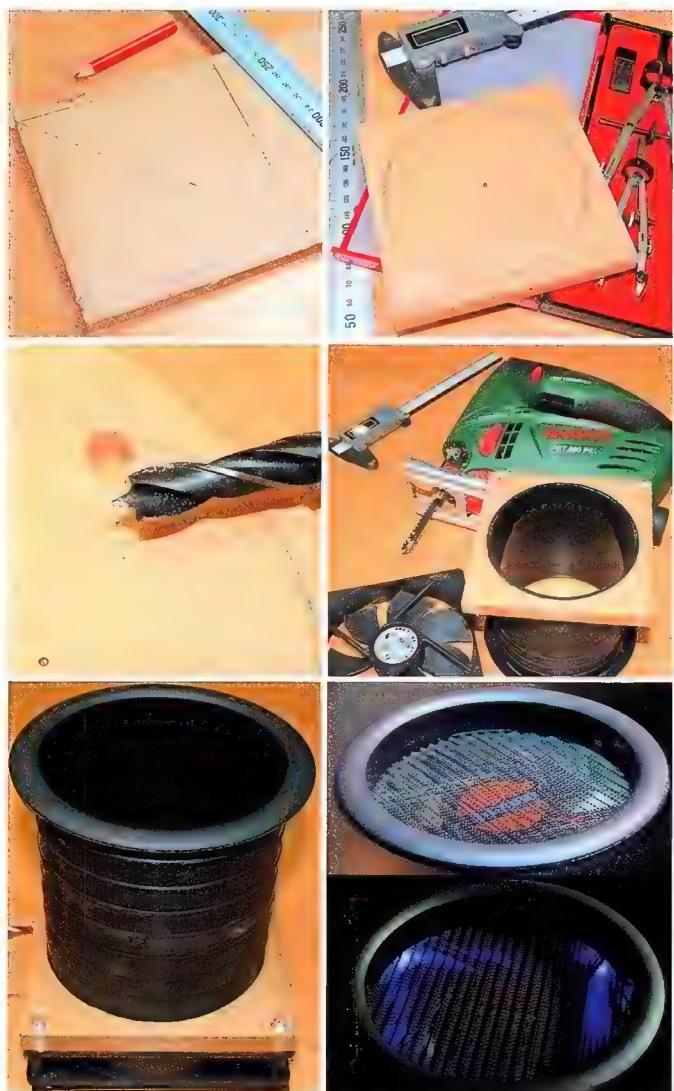
So, be 'environmentally aware'. That is, aware of the restrictions of the environment that you are working in. One method is to take some reference pics of your case with your system in place before you start, and refer to them as you progress. Another solution is to assemble a few cast-off components, such as an old PSU, MoBo, etc., that can be used for mock-up purposes without the fear of destroying something useful. Make all of your measurements, and then check them again, as even the best tradesmen and women get it wrong occasionally!

With the location sorted, the fun begins! The easiest and fastest way of cutting away the metal is with a hole saw and bench drill, but as that might be beyond your budget we will do this the 'skill building' way. Firstly, define the exact position of the fan, and mark out the four holes for the retention

screws. Most pencils won't fit down inside the holes, so the use of a centre-punch or large diameter nail will make the job easier. Drill the holes, attach a fan grill and then mark a line around the inner edge of the grill as the hole perimeter. This will ensure that your fan, hole and grill will all line up perfectly.

Cutting away the sheet metal is obviously more involved than in the case of the OEM grill, but utilises the same tools. When using a hacksaw, hand nibbler (http://en.wikipedia.org/wiki/Nibbler) or jigsaw, you will have to drill a 'pilot hole' large enough to fit the blade into as a starting point, whereas the Dremel can start cutting on any point along the scribed line. There are some alternative Dremel cutting bits that can be used when working with plastic or aluminium, such as the #199 High-Speed Cutter shown here, but they do have a substantial additional cost that must be budgeted for. We find that the #426 reinforced cut-off wheels are a good starting point if you already own a rotary tool, but prefer to use a jigsaw wherever possible – there is no substitute for industrial-level cutting power and flexibility!

Regardless how you have cut out the metal, the next step is to file and sand off the edges of the hole so that there are no sharp edges. Use a fine, half-round file in curved strokes to remove all of the jagged burrs, and then finish off with carbide sandpaper. The tool on the left of the file is an invaluable aid to getting a perfectly round finish; it is called a drum sander, and is attached to a power drill. As the name suggests it sands as it spins, and as it has a curved surface it will help remove 'waves' and 'bumps' from the perimeter edge. The last step in a steel case is to seal the surface, as mentioned above.

A little more complicated, but it follows the same principals every time.

▲ The main thing is to take your time and watch the detail.

mounting holes for the fan are then drilled and countersunk into the converter, on the side that will be pressed against the inner surface of the case top.

Once the case top has been cut to accept the port, in this case a flared bass-reflex tube from a sub-woofer, the tube can be cut to length so that it just reaches the bottom of the converter – the thickness of the case plus the thickness of the acrylic section, 9mm in this instance.

" Another variation of the fane hole is the 'screwless' look top blow-hole. "

Removing the top panel from the case will make life much easier when cutting and sanding, even if it means drilling out the rivets used to secure it. As we have suggested previously, it is a good idea to use masking tape to cover any case panels that you are working on, as it will help avoid scratches in the finish – as well as providing a better surface for drawing templates and lines. The 110mm hole for the tube was marked out, and then cut out with a jigsaw using a fine-tooth blade. After filing and sanding smooth, the port tube can be cut and glued to the case with epoxy glue.

The assembly of the converter/fan component is a sandwich; the converter is screwed to the fan, with a square of speaker grill between them to act as a grill. A 120mm chrome wire fan grill is attached to the side of the fan that is open inside the case. The final step is to fit a siliceous fan sheet around the port opening, to reduce fan vibration, and press-fit the fan assembly onto the port tube. If the two components are not a very tight fit, epoxy glue can be used to make it a permanent fitting.

And beyond!

Running out of word space mid-topic is annoying, but there's always next month! There are several more fan-fitting applications that are worth covering, including methods of painlessly replacing small existing fans with larger ones, that we can look at later. We will also have a closer look at some of the purpose-specific tools that are worth adding to your inventory. Meanwhile, if you're new to the prospect of modding your own case but want to get involved, our suggestion is to grab an old case and jump right in. The easiest way to gain skills is to practice and make mistakes.

Screw you!

Another, slightly more complex, variation of a fan hole is the 'screw-less' look top blow-hole. With this application the concept is to conceal the fan screws and give the mod an OEM look. The first step is to fabricate a 'fan-to-tube converter' out of an acrylic off-cut. The 8mm sheet is marked to match the size of the fan, and the central point marked and drilled with a 1mm bit. A compass is then used to scribe a circle that is just slightly smaller than the outside diameter of the tube, which in this case is 110mm. You might have noticed that there are two lines, the inner being for the initial cut, while the outer line is for the final dimension, and will be achieved by grinding out with a drum sander. The tube has to be an 'interference fit' inside the converter, which means that it needs to be as tight as possible so that they clamp together. A pilot hole is then drilled as a starting point for the jigsaw, using a Brad Point bit, which work really well in plastic. After cutting the hole out with a jigsaw, using a coarse wood blade at high speed, the edges are sanded and smoothed until the tube can only just be forced into the hole. The four

▲ Next month we will dig a little deeper into more specialised tools and effects.

ATOMIC.EDU

No surfing the Atomic forums during class, students!
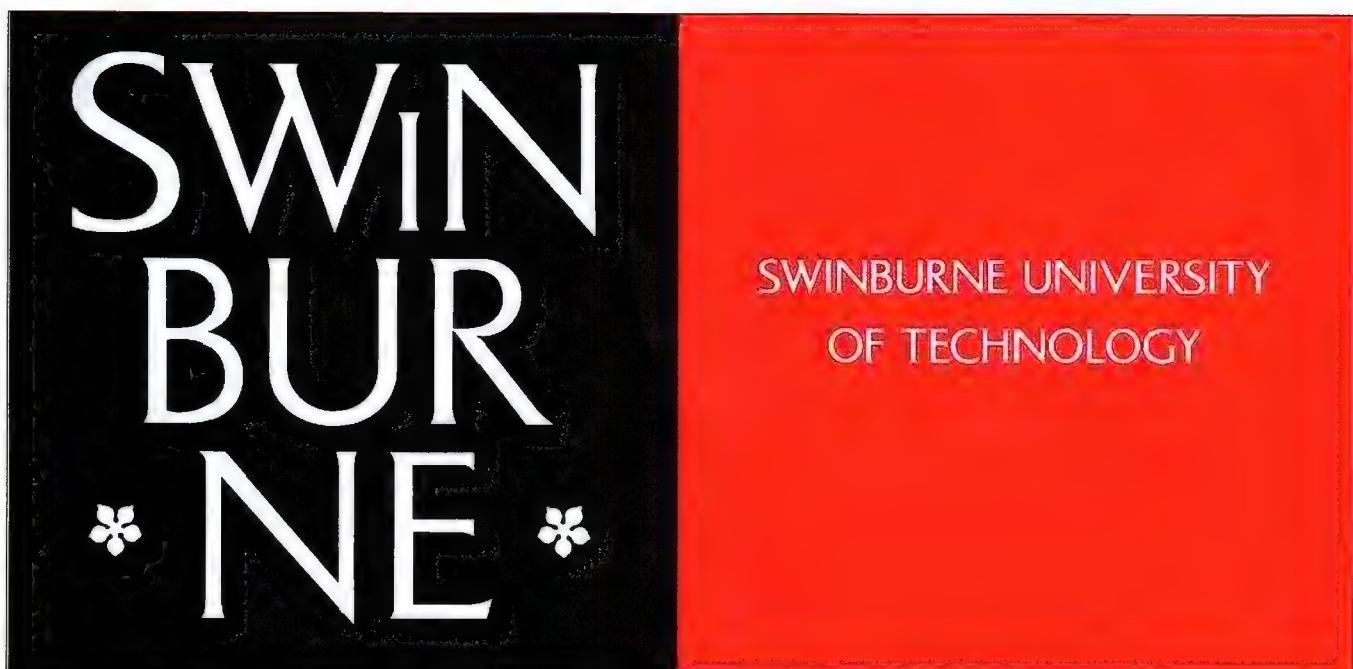
Swinburne University of Technology

Chris Taylor takes a close look at Swinburne University and what it offers budding IT types.

For Victorians – and, I suppose, Malaysians – looking at studying information technology at a tertiary level, Swinburne is surely an attractive option. It has campuses located throughout the inner and eastern suburbs of Melbourne, in Croydon, Lilydale, Hawthorn, Healesville, Prahran and Wantirna. There's also a campus in Sarawak, Malaysia. Swinburne, which is both a university and a TAFE, offers a large range of information technology certificates, diplomas, advanced diplomas, bachelor degrees, graduate certificates, graduate diplomas and master degrees. It is its range of Certificate IV-level-and-up courses we've decided to focus on in this month's atomic.edu.

Certificate IV in Information Technology

Run at the Hawthorn, Lilydale and Wantirna campuses, the Certificate IV in Information Technology is a year-long course that, in the first semester, covers the basics of working with computers such as project management, rudimentary troubleshooting and writing documentation. In the second semester, students are offered the opportunity to specialise in one of four areas – Multimedia, Networking, Programming or Websites, each with a decent selection of elective units on offer. If you choose to specialise in Multimedia, you'll look at, amongst other topics, Cascading Style Sheets, 2D animation, image manipulation and mark-up languages.

Networking students, on the other hand, look at network security, network configuration and server maintenance. Programmers look at open source software and building interfaces. They also work on the necessary skill of being able to take one's knowledge of programming and move painlessly between languages. Students of the Certificate IV of Information Technology (Websites) have a lot of units in common with their Multimedia and Programming counterparts, but also learn about the ins-and-outs of commercial software packages and designing and developing websites to meet specific client or technical restrictions. This is a Certificate IV level course – there's nothing too intense on offer here. Successful completion of the Certificate IV, however, is a requirement if one wants to move on to the Diploma of Information Technology.

Diploma of Information Technology

If you decide to stick around for a second year after completing your Certificate IV, you'll end up with a Diploma of Information Technology focusing, again, on one of four areas – Networking, Software Development, Systems Administration or Website Development. Too, for those of you who aimed to get into a bachelors degree in year twelve but failed to make the cut, the Diploma can form a sort of backdoor into Swinburne's university-level information technology offerings.

The units offered as part of the four specialisations build upon what students learn in their first year electives. Moving beyond the basics of network security and server maintenance, students of the Networking major, for instance, look at ensuring privacy for users, building intranets, writing scripts and some basic information systems theory.

As with the Certificate IV that precedes it, the Diploma of Information Technology is offered at the Hawthorn, Lilydale and Wantirna campuses. Which campus you end up at, though, depends on which field you elect to specialise in.

Advanced Diploma of Computer Science

This is a two-year course offered only at the Hawthorn campus, a kind of a step up from the Diploma. It allows students to specialise in software development, network analysis, scientific instrumentation or multimedia technology. Put simply, it's computer science as you know it, only cut down to the form of an Advanced Diploma.

The first year will see you cover much the same material as students of the Certificate and the Diploma, but with more coding, more networking and more theory. The second year sees you delve deeper into these three areas, as well as some basic business studies.

Like the Diploma, the Advanced Diploma can act as a pathway into university.

is a three-year course run through the Hawthorn and Sarawak campuses. It can be extended to four years if you choose to do a stint of industry-based learning. Just note that this option isn't available to those of you who are here as international students. There's also an industry project in the final year.

Topics covered include programming in .NET, basic accounting, basic marketing and basic databases, as well the meat of the kebab – project management, enterprise systems and the analysis and modeling of computer systems and processes within a business environment.

Bachelor of Computing

Again, a three-year course – with the option of an extra year of industry-based learning – offered at the Hawthorn campus. Those entering with the right TAFE qualifications to their name may be able to finish this course in 18 to 24 months.

Essentially, this is a programming degree. Aside from programming, the Bachelor of Computing covers abstract problem solving, project management, communication, databases and information systems.

Students of the Bachelor of Computing are able to major in one of four areas – software development, information systems, networks or multimedia and games development. An honours program is offered to those students who've, by their final year, proven capable of attending class and taking home respectable results.

Bachelor of Information Technology

A three-year course that includes 22 weeks of industry-based learning. The requirements, in terms of marks, aren't ridiculous – the clearly-in ENTER last year was 81.50 – but you will need to attend an interview and a briefing session. Curiously, all students receive a $33,500 scholarship paid over the duration of the course. Apparently the local information technology industry really likes this course – those scholarships are paid for by twenty of Australia's top organisations, according to Swinburne's website (**http://courses. swinburne.edu.au/Courses/ViewCourse. aspx?mi=100&id=21032**).

Student of Information Technology have to complete units on programming, information systems. Students are encouraged to pick up electives that cover not just information technology, but business too.

Bachelor of Science (Computer Science & Software Engineering)

Available only at Swinburne's campus in Sarawak, Malaysia. Essentially, it's a heavy coding degree – you cover logic and problem solving, software development, a couple of different languages and basic artificial intelligence. In the final year, you complete a year-long project.

Advanced Diploma of Computer Systems Engineering

Just like the above, the Advanced Diploma of Computer Systems Engineering is only offered at the Hawthorn campus. As the name suggests, the Advanced Diploma of Computer Systems Engineering is primarily focused on setting up, maintaining and fixing computers – both at a hardware and software level.

As a student of Computer Systems Engineering, you'll cover a bit of programming and a lot of networking, as well as a good deal of material related to project management and customer support.

Once more, the Advanced Diploma can be a pathway into a bachelor's degree.

Bachelor of Business Information Systems

Okay, so it's not strictly an information technology degree. We get that. Put simply, the field of information systems is all about learning how to take a look at a workplace and come up with and maintain some sort of computing solution for it that suits its needs and fits its technical, geographical, economic, legal or other restrictions. Essentially, it, like all areas of information technology, is about solving problems – albeit in a more abstract way than a programmer.

The Bachelor of Business Information Systems

Bachelor of Science (Professional Software Development)

Offered at the Hawthorn campus, the Bachelor of Science (Professional Software Development) covers abstract problem solving, basic object-oriented programming and rudimentary information systems in its first year, before moving onto heavier material in the form of database programming, different programming languages and software deployment and evolution. In the third year, there is a year-long software development project. There is another, more difficult one if the student chooses to study at an honours level for a fourth year.

Double degree programs

Swinburne offers a number of double degree programs, mostly through its Hawthorn campus. Keep in mind that with a double degree comes less electives than you'd normally have and more years at university. These offerings include:

• Bachelor of Engineering (Electronics and Computer Systems)/Bachelor of Science (Computer Science and Software Engineering).
• Bachelor of Engineering (Robotics and Mechatronics)/Bachelor of Science (Computer Science and Software Engineering).
• Bachelor of Engineering (Telecommunication and Network Engineering)/Bachelor of Science (Computer Science and Software Engineering).
• Bachelor of Multimedia (Games and Interactivity)/Bachelor of Science (Computer Science and Software Engineering).

Graduate certificates and diplomas

Numerous six-month or year-long graduate certificates diplomas are on offer too. The entry requirements for these, in general, are quite simple – so long as you have a semi-respectable academic record and haven't studied in this field before (i.e. you can't get into a Graduate Diploma of Information Systems if you've a Bachelor of Information Systems), you're eligible. Real world experience relevant to the Graduate Diploma's material will help your cause a lot. Swinburne's offerings in terms of information technology-related Graduate Diplomas include:

• Graduate Certificate of Information Systems Management
• Graduate Certificate of Information Technology
• Graduate Certificate of Science (Network Systems)
• Graduate Certificate of Technology (Business Systems Design and Management)
• Graduate Diploma of Information Systems Management
• Graduate Diploma of Information Technology
• Graduate Diploma of Science (Network Systems)
• Graduate Diploma of Technology (Business Systems Design and Management)

Master degrees

In recent years, Swinburne has binned a good many of their old master degrees. Now all that remains are the following. These courses range between 18 to 36 months in length and all but one is available only at the Hawthorn campus. Requirements of these degrees are usually a semi-respectable academic record and a bachelor degree in a semi-relevant field (meaning, for the most part, something in the realm of business, information technology, science or engineering). Those with relevant real world experience are looked upon favourably, even if their prior qualifications are irrelevant.

• Master of Technology (Business Systems Design and Management)
• Master of Technology (Information Technology)
• Master of Science (Network Systems)
• Master of Science (Computing)
• Master of Information Systems Management
• Master of Information Systems Management/ Master of Accounting
• Master of Information Systems Management/ Master of Business Administration
• Master of Information Technology (Professional Computing)

INPUTOUTPUT

Fixing stuff no one else can, including God and your mum

I/O

Dan Rutter brings the answer like no-one else can!

I/O OF THE MONTH

Wanted: GTX 280 with eating disorder

I purchased a slim barebones media center system with integrated video 12 months ago, with the intention of playing a few games on it at some stage, not realising that half-height video cards were such rare beasts.

Can you suggest what I should be looking at? Ideally I'd like it to be capable of playing 3D games (WoW, but not necessarily Crysis at high settings), but not sounding like a 747 taking off when watching TV.

Michael Armstrong

World of Warcraft is, fortunately, quite undemanding. Its 'Recommended' video card **http://us.blizzard.com/support/article. xml?articleId=21054&rhtml=true**

(not the 'Minimum', which is always laughably inadequate) is only a "64Mb GeForce FX 5700 class card or above".

It's not too hard to find a low-profile card with quite a bit more grunt than a GeForce 5700 - Even if you want a card with a fanless heat sink cooler, to keep the noise down.

One recent entrant in the slimline-card market that would probably suit you quite nicely is the Radeon HD 3450. It's based on the same R600 core as the rest of the HD two- and three-thousand-series cards, but is way slower than the more glamorous members of the three-thousand series, the HD 3850 and 3870. That's partly because it's got considerably slower RAM, but it's mainly because the 3450 has only 40 Stream Processing Units, versus the HD 38xx cards' three hundred and twenty.

There's also an HD 3470, which has 800 and 950MHz standard core and RAM clock speeds to the 3450's 600MHz core and 500MHz RAM.

It's still only got about a quarter of the fill rate of a 3870, though, and I don't know whether you can get a low-profile 3470. If you can find one then it should only cost $20 or so more than a 3850, which is a good deal, but the only one currently available in Australia seems to be a passively-cooled Sapphire-branded full-height version, which is useless to you.

The slimline 3450 usually comes with a full-height bracket on the back, which you can swap for a low-profile bracket if you like – note that you may have to pay extra to get a low-profile bracket.

There are two kinds of low-profile bracket. One is just a shorter version of the standard one-slot bracket, which doesn't have much room for connectors, so you'll only be able to use the DVI and TV-out connectors, not VGA. The other kind of bracket is double-wide. It'll stop you from putting anything in the adjacent expansion slot, but the tradeoff is that the VGA connector moves to the second half of the bracket; the 3450's VGA socket is on a little cable, not part of the video card proper. So that's the type I'd go for.

There's a review of the 3450 at **tinyurl. com/4E74GV** which includes tests on various current games. It turned in predictably miserable results in World in Conflict and Call of Juarez, but actually did a pretty good job (after a bit of settings tweaking...) with

Enemy Territory: Quake Wars at 1024 x 768. ETQW is the least demanding of the current crop, but anything that can run ETQW okay should be more than fast enough for WoW. And pretty decent for lots of other older 3D games, like Half-Life 2.

And, to put it all in perspective – you know that Radeon 9700 Pro you bought for $700 back in 2002?

Well, the humble HD 3450 is about three times as fast as the 9700 Pro.

Quite modest video cards can work well in HTPC applications, because even huge digital TVs don't have a lot of pixels. If your TV's a 1080p monster then it'll have 1920 x 1080 pixels, which is slightly more than a 1600 by 1200 computer display, and requires at least a mid-range graphics card if you want to play recent games. A 720p widescreen TV, though, only has 17 per cent more pixels than 1024 x 768. It doesn't take too much effort to paint that much screen at a reasonable rate.

▲ **A cut-down Radeon. Literally.**

My router is ringing

I I have a wireless router with RJ45 ports. The problem is I'm planning to move to ADSL which requires an RJ11 port. Is it possible to use this wireless router for my ADSL through an RJ45 to RJ11 converter?

Stephen Quoy

O No, there is no way to adapt an RJ45 Ethernet socket into an RJ11 phone socket.

It's actually possible to plug an RJ11 phone lead straight into an RJ45 socket; you don't need a plug adapter at all. Unless the device you're plugging that phone lead into can switch the socket to work as a phone connector as well as an Ethernet connector, though, doing this is at best pointless, and can in theory cause damage. The 'on-hook voltage' of a standard Australian phone line is 48VDC, which turns into 85VAC when the phone rings. You don't want to be hooking that up to an Ethernet card.

The designers of the RJ pinouts foresaw these sorts of mistakes, though, so it's actually unlikely to hurt anything. A standard single-line RJ11 phone connection uses only the two contacts in the middle of the plug, and those two contacts aren't connected to anything in a standard Ethernet socket. So you probably won't fry an Ethernet device if you plug a phone line into it. But it won't work, either.

You can still use your router, though. All you need is an ADSL 'modem' (actually a 'terminal adapter') with its own RJ45 Ethernet connection (which is to say, pretty much any ADSL adapter). Then you can plug the DSL adapter into the router, and the adapter will appear on your network like any other device, and you can then set it up using the browser interface that all normal DSL adapters have these days.

Intermit ent sou d pro lem

I've got a TViX 5130SH running optical and coax into Logitech Z5500s, but when watching Hi Def digital TV through the TViX, the sound cuts in and out. On closer inspection, the signal is inconsistent to the speakers – it says it receives it, then suddenly says no digital, then back to digital. Can't work out why this is.

Is there such a thing as an optical amp that could feed a consistent signal to the speakers, so they don't turn themselves off?

James Buzzard

My first guess would be that the tuner in the TViX box is having trouble hanging onto the signal. This may be because your antenna's not good enough or not well enough aimed, but the antenna could also be perfectly adequate; some digital TV tuners are just better than others.

Note that if it's a tuner problem, it shouldn't make any difference whether you're using the digital or analogue outputs from the PVR. If the digital audio outputs cut out but the analogue output doesn't, then the problem lies somewhere else. But I bet everything actually cuts out at once.

(Oh, and if the optical digital connection is flaky but none of the other audio outputs are, it may just be a damaged TOSLINK cable, or even some fluff in

▲ This HD tuner box was pretty hot stuff in 2002. Then they changed the channels around, and now it can only get about half of them.

one or both of the optical sockets.)

If all you've got a problem with is a cheap set-top box, then switching to whatever other cheap set-top box the local TV-shop people say works best in your suburb will solve the problem. When the tuner's part of a more expensive appliance, as it is in your case, then fixing tuner problems is of course more of a pain. Fiddling with the antenna may, with any luck, be good enough.

But I'd definitely look for tuner problems first, rather than hunt for problems with the connection between the PVR and the speakers. By all means try a new TOSLINK cable, but if that doesn't help, it's probably the tuner.

Piratical plugs

I I've finally decided to join the world of high definition, and purchased a 32in Sony LCD TV.

I swear I didn't plan it this way (or so I'm telling the little woman), but it turns out that the TV has an HD15 jack and supports PC input. This obviously means I need to build a PC for my new TV.

My plan is to build a fanless SFF box (I'm leaning towards something based on a VIA Eden CPU) with integrated graphics, one optical drive and one hard drive. The main use would be for surfing the Web and playing legal backup copies of old 8- and 16-bit console games. The one thing I'm debating is whether it would be worthwhile to use a Blu-Ray drive for the optical drive.

Would I be able to view Blu-Ray movies in true Hi-Def over a VGA (well, technically WXGA) connection? If so, would something running off an Eden with Via's integrated graphics be able to handle this, or would I need more processing power?

Eric Branchaud

O Blu-Ray movies aren't meant to be viewable in high definition without an HDCP Copy Control Crap chain all the way from the player to the display device. It's impossible to send HDCP over any analogue output, so plain old VGA-out ought to be a non-starter.

As you'd expect, though, ways to walk around the DRM bollocks already exist. The Blu-Ray and HD-DVD AACS encryption scheme was completely cracked in early 2007; that made it possible to extract the device keys from any high-def disc player, and use them in some other piece of software, which can then output the decrypted data in any way it likes, including to any old computer monitor.

I think Slysoft's commercial package AnyDVD HD was the first to let you play or rip Blu-Ray movies without DRM, but now there are various others. So that's all fine. But no, a low-power Eden system probably won't be able to handle HD video data rates: **tinyurl.com/2PPNHW**.

▲ ...and that's how you make a Skype phone!

FALLOUT
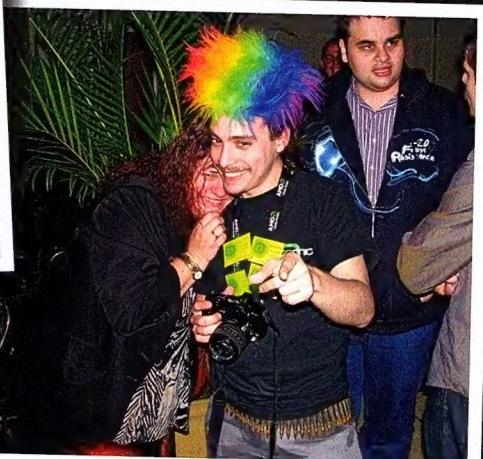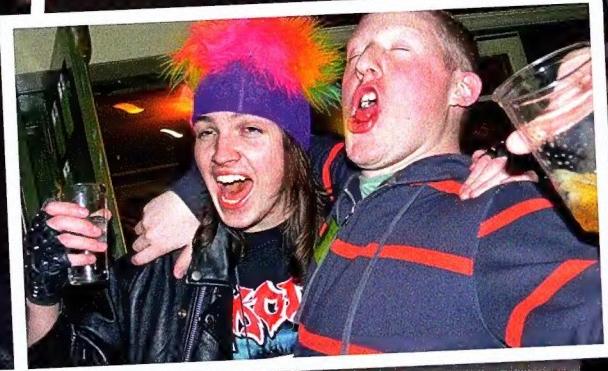**Funnies and humour from the fallout zone**

Meet 8

Last month a whole metric mess of Atomicans gathered from all around Australia for the long-awaited Meet 8. Held in Sydney, this was a chance to meet old friends, put faces to your favourite new atomicans, and generally chill out in a pub over a few beers and games of pool. It was a hell of a night.

See you next year, guys!

PS: Didn't know this was on? Then you MUST get yourself onto the Atomic forums, at **www.atomicmpc.com.au**

NEXT MONTH A new Atomic dawn is coming…

atomic